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DEVELOPMENT TESTING OF THE PHASE I ARMAMENT SUBSYSTEM HELICOPTER 2.75-INCH ROCKET LAUNCHER XM3

by

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ABSTRACT

This report presents data and information concerning tests of Phase I Armament Subsystem, Helicopter 2.75-inch Rocket Launcher, XM3, including modular pod jettison tests, flight rocket firing accuracy tests, and miscellaneous tests, conducted during the period 20 April through 4 October 1962. These tests were part of the approved test plan for developing an interim area rocket weapon system for the HU-1B helicopter. These tests were conducted by Test and Evaluation Laboratory, U. S. Army Missile Command at Fort Rucker, Alabama, Fort Worth, Texas, and Redstone Arsenal, Alabama.

The weapon system tested consisted of two 24-tube launcher pods containing a maximum of 48 2.75-inch folding fin aircraft rockets and a fire control system with sighting, computing, and weapon servo drive capabilities.

The design and development of the system are considered adequate for a Phase I program and all major problems encountered have been successfully resolved.

This report covers the completion of the Phase I test program.

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DEVELOPMENT TESTING OF PHASE I ARMAMENT SUBSYSTEM HELICOPTER 2.75-INCH ROCKET LAUNCHER XM3

I. INTRODUCTION

The Phase I armament subsystem, helicopter 2.75-inch rocket launcher XM3 is being developed for the HU-1B helicopter to provide an area weapon system with a concentrated high rate of fire to be delivered for use in the field in the shortest possible time. The development testing, set forth in the Revised Development Test Plan, dated 20 November 1961, and in later amendments, was completed on 7 August 1962. The tests were conducted at Fort Rucker, Alabama, by Test and Evaluation Laboratory, Directorate of Research and Development, U. S. Army Missile Command, in conjunction with U. S. Army Aviation Board, Fort Rucker, Alabama, and the U. S. Air Force.

Jettison test (test 4a Ref. 1), the accuracy firing portion of test 5.b (para. 3.b (2) Ref. 1), and the last three firings listed in paragraph 3.b (1) of test 5.b (Ref. 1) were conducted during the period 15 June through 7 August 1962. This report presents the results of this testing and supercedes Reports of Firing No. 12, 13, and 15 through 21.

All other phases of testing set forth in the Revised Development Test Plan were completed at an earlier date and the results are presented in published reports listed under References 2, 3, 4, and 8.

The test aircraft was flown to the Bell Helicopter Company, Fort Worth, Texas, to be modified. The complete XM3 system was rewired and the computer, amplifiers, and J-box were removed from the side of the cockpit and mounted in the baggage compartment. Post modification tests were conducted from 20 September through 4 October 1962, at Bell Helicopter and Redstone Arsenal to determine the adequacy of these modifications.

II. DESCRIPTION OF TEST HARDWARE

A. Helicopter System

1. HU-1B Helicopter, (Fig. 1-3). The standard HU-1B helicopter, Serial No. 60-3588, was built by Bell Helicopter Company. The T53-L-5 free turbine engine is rated at 960 shaft horsepower,

the design gross weight of the basic HU-1B (without external stores) is 6,600 lb, and the maximum overload gross weight is 8,500 lb.

2. Universal External Stores Pylon (HU-1B), (Fig. 6). One helicopter set (P/N 204-071-530) consisting of four pylons (two per side) was designed and provided by the helicopter contractor.

B. Launcher System (Fig. 4)

The system consists of two modular launchers attached to the universal pylons by means of a structure assembly.

Major elements of the structure assembly are the crank and cross beam assembly, adapter assembly, and actuator connecting bracket assembly (Fig. 5). Each structure assembly has three Teflon pads (two aft, one forward) which slide against two bearing arcs when the pods are elevated through an angle not to exceed +6° and -20°.

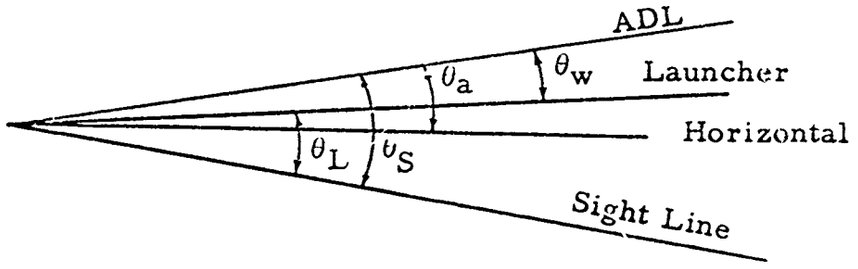
Power for this launcher movement is supplied by the actuator. The structure assembly also includes two brackets and explosive bolts for pod jettison purposes.

The pod itself is an open breech, tube type composed of four modules containing six 2.75-inch FFAR tubes each. In this report the modules are numbered one through four starting from the most outboard module. Likewise, tubes are numbered in their order of firings starting with the topmost tube in module one and alternating tubes downward with all tubes being counted in one module before moving inboard to the next module (Fig. 6). Modular pods are designated left and right as viewed from the pilot's seat looking forward.

C. Fire Control System

1. Projectors and Transparent Reflectors (Fig. 7). A projector and a transparent spherical segment reflector are provided on each side of the helicopter cockpit. The projectors are arranged to project optically a reticle image on the focal plane of the reflectors in a manner to provide a return collimated image to the operator (Fig. 8). Each projector is equipped with a movable mirror which when rotated will cause the retical display to rotate in elevation about an axis near the operator's eye location. The angular position of the line of sight with respect to the ship's armament datum line (ADL) is measured and transmitted by each projector to the elevation offset computer and the weapon drive. The line of sight may be manually set in elevation by a hand knob, or it may be remotely driven by a servo control in either projector.

2. Elevation Offset Computer (Fig. 9). The elevation offset computer computes the proper weapon launch position with respect to the helicopter's ADL. Inputs to this computer are sight elevation angle θ_s (from projector), ship's pitch flight angle with respect to horizontal θ_a (from Lear vertical gyro unit), estimated range and aircraft air speed and altitude (hand set dial). The output is the launcher offset angle above the line of sight required to hit the target θ_L. This output angle is differentially added to the synchro signal defining the line of sight position to obtain the weapon launcher position with respect to the ship's ADL, θ_w:



3. Thrust-Type Motor-Actuator Assemblies (Fig. 4). Thrust-type motor-actuator assemblies are provided for the left and the right rocket pod assemblies. Associated with each weapon system assembly is a synchro control transformer unit geared to the weapon elevation axis.

4. Amplifier Unit (Fig. 9). The servo amplifier required to power the actuators, the control relay switching and electrical interconnection boards, together with many operating elements of the computer, are mounted in an amplifier unit, packaged in a separate box and located in the ship's cabin next to the computer.

5. Firing Circuit (Fig. 10). The firing circuit is made up of a 33-step intervalometer with ripple selector stops at 1, 2, 3, 4, 6, and 24 pairs, arming switch and light, triggers on each control stick, counter, and associated cables.

6. Jettison Circuit (Fig. 10). The jettison circuit consists of a jettison circuit switch and lights on the center console and associated cables connecting to the four explosive bolts.

7. Limit Switches. Limit switches are included in the system to interrupt the firing voltage when the pods are elevated or depressed to a position which would make it unsafe to fire. Also, an error limit

switch is included which interrupts the firing voltage when there is too great a difference between the elevation of the sights and pods.

D. Rocket System

The 2.75-inch folding fin aircraft rocket (modified) has four nozzles slashed at an angle of 24°. It has an outside diameter of 2.75 inches, a length of 48 inches, a total weight of 17.79 lb and a warhead weight of 6.47 lb. The rocket is stabilized in flight by four rearward folding fins which are actuated by motor pressure. Complete details concerning the rocket are presented in Reference 7.

E. Weight Summary

The gross weight of the components of the armament subsystem, helicopter, 2.75-inch rocket launcher, XM3 are as follows:

Item	Quantity	Unit weight, lb	Total weight, lb
External store pylon with braces	2	14.75	29.5
Cross beam	2	58.5	117.0
Modular pods	2	129.6	259.2
Computer junction box	1	110.0	110.0
Actuator	2	15.5	31.0
Intervalometer and control panel	1	3.0	3.0
Sights and other miscellaneous items			31.5
2.75-inch FFAR	48	17.79	853.92
Total Weight			1,435.12

F. Instrumentation

Instrumentation required for each test is covered in the appropriate section concerning these tests.

III. JETTISON TEST

A. General

This portion of the test program was conducted since under certain conditions it might be necessary to jettison the pods in flight for safety purposes. To enable the jettison process to be carried out, the system was designed with the launcher pods attached to the crank arms, top and bottom, by explosive bolts (Fig. 11).

From 15 June through 19 July, 10 pods were jettisoned from the HU-1B under different flight conditions which could exist during a tactical mission. On eight flights a single pod was jettisoned from the left side, and on one flight pods from each side were jettisoned simultaneously. Prior to any flight test both pods were jettisoned with the aircraft on the ground.

B. Test Objective

The objective was to determine the effectiveness of the jettison design feature and the helicopter response after a jettison.

C. Instrumentation

Instrumentation for this test consisted of a 16-mm camera mounted on the forward end of the helicopter skid looking back at the pod to determine any trouble encountered in the separation of the pod from the crank arm. On jettison tests 4 through 9, 11 strain gages were located on the pylons to determine the forces imparted to the hardware during jettison. Since no problems were encountered, these records will not be reduced unless specifically requested.

D. Test Procedure and Results

For the intial phase of jettisoning, a static test was conducted with the modular launchers. Sufficient padding was placed on the ground under each launcher to prevent damage. The delay time between ignition of the squib in the top bolt and the bottom bolt was 300 milliseconds. This permitted the pod to swing clear of the crank arm before falling. From all visual inspection, the jettison was accomplished as expected with no difficulty.

The in-flight jettison test was conducted using dummy launchers (Fig. 12) consisting of cardboard tubes filled with sand to obtain the correct

weight, c.g., and moments of inertia. Ten such launchers were utilized in the test with eight single jettisons from the left side and one simultaneous from each side. All jettisons were made at an altitude of 4,000 feet and under the following conditions:

1. Left side, level flight, 20 knots air speed.
2. Left side, level flight, 40 knots air speed.
3. Left side, level flight, 60 knots air speed.
4. Left side, level flight, 80 knots air speed
5. Left side, level flight, 100 knots air speed.
6. Left side, descent rate of 500 ft/sec.
7. Left side, descent rate 1,200 ft/sec.
8. Left side, autorotation.
9. Left and right sides, level flight, 80 knots air speed.

As noted these test conditions do not conform to the test 4a in Revised Development Test Plan for Phase I Aircraft Interim Area Rocket Weapon System (Ref. 1). The U. S. Air Force personnel associated with the test felt that the test plan did not define an adequate envelope of test conditions. Based on data obtained from these tests, the U. S. Air Force certified the armament jettison system to be satisfactory for flight operations.

For the first flight jettison, the delay time between the explosive bolts was the same as the static test (300 milliseconds). Film from the camera mounted on the skid showed that the launcher hit the skid during the fall. This was caused by excessive delay time between ignition of the explosive bolts, permitting the launcher to rotate in toward the skid before the bottom bolt was blown free. This also placed excessive forces on the bottom explosive bolt causing it to shear (Fig. 13) and the threaded portion to stay with the nut. After the bolt sheared and before it ejected, the launcher moved downward causing damage to the crank arm (Fig. 14).

Review of the film from the skidmounted camera indicated that a delay time of 100 milliseconds on the explosive bolts would allow the launcher to rotate sufficiently to clear the crank arm and fall free.

After this modification of the jettison system, the remainder of the tests were conducted with no difficulty.

During the double jettison test, the pilot accidentally jettisoned the pods on the ground when he attempted to start the engine. The malfunction

was traced to a double acting relay in the system which required power to both close and open. The malfunction occurred at this time because the circuit breaker was open while the jettison switch was in the "on" position and then when the switch was moved to the "off" position no current was available to operate the relay and open the circuit. Therefore, when the pilot closed the circuit breaker prior to starting the engine, the pods were jettisoned. Little damage occurred to the dummy pods and they were again attached to the helicopter.

IV. ACCURACY FIRING TEST

A. General

From 15 June through 6 August 1962, 502 2.75-inch folding fin aircraft rockets (FFAR) were fired at Mattison Range, Fort Rucker, Alabama, from an HU-1B helicopter. These firings consisted of single pairs, 6-pair ripples, 24-pair ripples, and one 18-pair ripple.

These firing conditions are set forth in Amendments 1 and 2 to test 5.b of the Revised Development Test Plan, dated 20 November 1961. Paragraph 3.b (2) of Amendment 1, dated 9 February 1962, was followed as closely as the operating limits of the launcher limit switches would permit. Table I presents a schedule of firings as outlined in the test plan. Table II presents the actual firings that were conducted during the tests with explanations for the number of rounds fired if different from the test plan. The firings omitted from these tests were a result of operating limitations described above.

The last three firings set forth in Amendment 2, dated 27 March 1962, were also conducted at this time.

Accuracy stated herein does not imply the ability of impacting the rockets on the intended target, but rather the ability to hit where t fire control system directs the round. Also, during the firing of the accuracy test, four different people acted as gunner, or were responsible for maintaining the sights on target in elevation. Since the control in elevation seems extremely sensitive, it is felt that the tendency was to over-control the system in the vertical plane on most firings. The comments of the pilot on the sight position presented in Table III are helpful but they are not considered to be very accurate.

B. Test Objectives

The objectives of these tests were as follows:

1. To determine system accuracy.
2. To isolate error sources.
3. To verify system safety.

C. Instrumentation

To determine the position of the HU-1B helicopter at the time of fire, four 35-mm Mitchell cameras were positioned 575 feet from the desired point of fire and 0°, 90°, 180°, and 270° relative to the line of fire. Pitch and yaw position of the helicopter at the time of firing was also determined from the above cameras. One each 35-mm Mitchell camera was positioned 575 feet from the firing point and 90° and 270° relative to the firing line. The time of fire of each rocket was determined from this camera coverage. One 35-mm Mitchell camera was positioned on a tower approximately 100 feet to the right of the line of fire and photographed the rocket impacts. The time of rocket flight was obtained from this camera. Each of the seven Mitchell cameras was equipped to place 1,000-cycle timing on the film, whereby the film from any camera could be correlated with the film from any other camera.

One 35-mm motion picture camera aboard a chase helicopter flying overhead was used to photograph the impacts of the rockets fired on flights 1 through 20. One K-24 aerial camera aboard the chase helicopter was used to photograph the impacts of the rockets fired on flights 21 through 79.

Instrumentation on board the HU-1B helicopter consisted of a gyro to determine pitch and yaw velocity and acceleration, a potentiometer on each pod and each sight to determine their position in relation to the datum line of the ship, and twelve SR-4 Baldwin strain gages and eleven Statham accelerometers on the externally mounted hardware to determine the forces imparted to the hardware during firing.

These data were recorded on a 36-channel capacity C. E. C. recorder mounted in the rear of the cockpit. These data were for information purposes if trouble was encountered with the hardware. Since no trouble occurred, these records will not be reduced unless specifically requested. The trigger voltage and limit switches (up and down on each pod and error) were also monitored. These data were recorded on a 18-channel capacity C. E. C. recorder mounted beside the 36-channel recorder.

D. Test Procedure and Results

The firings of 15 June through 6 August were conducted with complete fire control unit included in the system except, as noted, the limit switches were bypassed for some firings. The fire control unit was placed in the stabilized position for all firings. This permitted the computer to take a signal from the aircraft gyro and from this signal maintain the sights and pods at the same Q. E. even though the aircraft was changing attitude. The mode selector switch was placed in the split position which permitted the co-pilot to keep the sights on the target in elevation and the pilot to maintain the sights on target in azimuth and to fire the rockets.

As noted in Table III the nominal range inputs to the computer were 600, 1,200 and 1,800 meters. However, the actual distance to the respective targets was 675, 1,250, and 1,850 meters.

The procedure followed for conducting the accuracy firings was to repeat any firings if it was determined that instrumentation trouble on a flight would prevent the data requirements from being obtained. On flights 59 through 69 it was not determined that impact data had not been obtained until after the test had been completed. As noted in Tables I and II several firings were substituted for others outlined in the test plan because the conditions set forth in the test plan could not be met. Also several firings were repeated because needed data were not obtained on the scheduled firings.

The procedure followed on reducing data obtained during the accuracy firing test was to reduce data only on rounds where complete data were obtained, except impacts, unless a specific request was received from participating personnel. The meteorological data, launch data and flight data are presented in Table III. As noted, several flights show no flight data. This does not mean that no data were obtained but only that complete data were not obtained.

The firings of 15, 19, and 21 June were conducted primarily to check instrumentation but were also to be used for accuracy rounds if sufficient data were obtained. During these firings 17 single pairs, two 6-pair ripples and one 18-pair ripple were fired. These firings gave a sample of the impact coverage which would be needed during the test. The 18-pair ripple was fired primarily to give the pilot a "feel" of the helicopter when firing a large ripple, since a firing demonstration of a 24-pair ripple was scheduled on 27 June and prior to this he had fired only a six-pair ripple.

Prior to the firings, the launchers were boresighted to insure they were parallel to each other and that they were aiming at the same point as the sights with the computer cut out of the system. After flights one and two, it was found that the shorting plugs had not been removed from the computer rendering these rounds useless for data purposes.

For the firings on 15, 19, and 21 June, H.E. heads were used on the rockets and a 35-mm motion picture camera running at 50 frames per second aboard a helicopter was used to photograph impacts. The altitude of the helicopter was 2,500 feet on flights 1 through 13 and 3,500 feet on flights 14 through 20.

After reducing the impact data on flights 1 through 20 it was found that less than 45 per cent of the rocket impacts were obtained. This was not sufficient to fulfill the data requirements.

Using smoke heads on the rockets and a K-24 aerial camera to photograph the impacts, the accuracy firings were continued on 9 and 10 July 1962. On these dates 20 single pairs were fired (flights 21 through 40). On flight 22 the intervelometer selector switch was set on single pair. One pair fired and after a short interval a second pair fired. By checking the data (CEC record), it was found that the error limit switch had interrupted the firing circuit immediately after the first pair fired. Then as soon as the error was within limits, the intervelometer started another cycle and before the trigger was released another pair fired. This is designed into the system so that any interruption in the firing voltage, whether trigger release or limit switch, will start the intervelometer through another cycle. During the remainder of the test, the limit switches were bypassed when firing single pairs.

As noted on this series of rounds approximately 95 per cent of the impacts were obtained.

From 30 July through 6 August 1962, 374 rockets were fired for the accuracy test at Fort Rucker (flights 41 through 79) consisting of single pairs, six-pair ripples and 24-pair ripples. On flight 41, a misfire occurred on the right side in tube no. 21. A check revealed that the voltage on the firing circuit and resistance on the rocket were within tolerance. The next six-pair ripple (flight 42) fired without incident. On flight 43, tube no. 21 on the right side again misfired. A check was made and a short in the firing circuit was discovered. A thorough inspection showed that the connector in the firing circuit between modules 3 and 4 contained excessive potting compound and the vibration of the helicopter was causing the circuit to tube no. 21 to short. The connector was repaired and no further trouble was encountered in this area.

On flight no. 46, the side cameras did not run. Therefore, an extra pair was fired under the same conditions.

The underneath cameras did not run on flight 52 and an extra pair was fired at the same conditions.

Flight 64 was a scheduled six-pair ripple but after firing two pairs the pilot released the trigger. Flight 65 was a repeat of flight 64.

Flight 74 was a scheduled six-pair ripple. After firing five pairs the upper limit switch interrupted the firing voltage.

Flight 75 was a 24-pair ripple fired from hover. The rockets were modified with crimped instead of slashed nozzles and H. E. heads instead of smoke.

Flight 76 was a scheduled six-pair ripple but after two pairs had fired the pilot released the trigger. It was determined that a six-pair ripple could not be fired under these conditions.

Flight 77 was a scheduled 24-pair ripple using rockets with crimped nozzles. After ten pairs had fired, the firing voltage was interruped by the upper limit switch. It was determined that a 24-pair ripple could not be fired under these conditions.

Flight 78 was a scheduled 24-pair ripple. The firing was interrupted twice by the lower limit switches and once by the upper limit switches. All pairs were fired, but due to the interruptions no valid data were obtained.

Flight 79 was a 24-pair ripple and for this firing the limit switches were by-passed. Instrumentation shows that the pods were in the upper limits on all firings except pair no. 19.

V. POST MODIFICATION TEST

A. General

After the accuracy firing test was completed at Fort Rucker, Alabama, the aircraft was flown to the Bell Helicopter Co., Fort Worth, Texas, where the computer servo amplifiers and junction box were moved from the rear of the helicopter cockpit and mounted in the baggage compartment. All wiring to the XM3 system was changed.

When these modifications had been completed, the system was tested at Bell Helicopter and Redstone Arsenal. The test at Bell consisted of static tests to determine the adequacy of the modification relative to proper circuits, sequence, etc. The test at Redstone Arsenal consisted of ground firings and flight firings to determine the adequacy of the modification under actual firing conditions.

B. Bell Helicopter Tests

1. Objectives. The objectives of these tests were to insure that the wiring for the HU-1B helicopter 2.75-inch armament system was acceptable and the the installed system operated in the expected manner.

2. Instrumentation. Instrumentation for these tests consisted of one C. E. C. recorder securely bolted to an aluminum table in the rear of the cockpit. The data recorded on this instrument included pod elevation, sight position, firing pulse, system error, electrical limits, and trigger impulse.

3. Test Procedure and Results. After assembly and installation of the complete armament system, the continuity of the basic circuitry was thoroughly checked. The system was then electrically zeroed and harmonized to assure that the elevation of both pods was always equal and that the pods followed changes in the sight elevation properly. Firing voltages on all tubes were checked and one full complement (48) of MIAI squibs was fired manually (one at a time). It was noted at this point that the firing order of each module was reversed. Therefore, the two firing line plugs at the junction box (J2 and J3) were interchanged and the firing order rechecked. The order was now found to be correct.

Another full complement of squibs was installed and a flight test accomplished. During this test, the C. E. C. recorder was continually running. In-flight maneuvers included normal target tracking and forced pitch oscillations in the helicopter while tracking a target. A full 24-pair ripple of squibs was fired while in flight. Total flight time was approximately 15 minutes. Examination of the squibs which had been fired and the oscillographs indicated no apparent malfunctions.

C. Redstone Arsenal Tests

1. Test Objectives. The objectives of this test were as follows:

a. To determine the adequacy of the modifications under actual firing conditions:

b. To obtain the g load and vibration environment of the relocated junction box.

c. To measure the temperature in the baggage compartment.

d. To determine if the sights and pods moved in proper relation with each other.

2. Instrumentation. Instrumentation on this test consisted of three accelerometers, one measuring in each plane, mounted on the base of the junction box, one thermocouple mounted on top of the junction box, and potentiometers on the pods and sights. The firing voltage impulse and operation of the limit switches were also monitored.

3. Test Procedure and Results. The testing at Redstone Arsenal was conducted at Test Area 1 and was initiated by firing a 24-pair ripple from the aircraft while it was on the ground. This firing was conducted to check the safety of the system before flight firings were started. Unmodified rockets were used and no difficulties were encountered. Two 6-pair ripples were then flight fired as a demonstration and no attempt was made to obtain data.

During firing of the second six-pair ripple, the pilot noted some object falling to the ground in front of the helicopter immediately after firing. After searching the area it was found that one rocket had impacted about 300 feet after firing. The nozzle and propellant were missing from the rocket. Upon inspecting the launcher pod, it was found that the firing contact arm was bent indicating the nozzle had been blown out the rear of the tube. The rocket motor case showed no sign of rupture or scoring around the nozzle area which indicates that the nozzle assembly lock wire was absent at firing.

To satisfy the objectives as listed for this test, four 6-pair ripples and one 24-pair ripple were flight fired.

The four 6-pair ripples were fired with inputs to the computer of 1,500 meter range, 50 meters altitude, and 0 knots air speed. The actual helicopter air speed was 90 knots but due to a partially inoperative fire control unit, it was necessary to place 0 air speed into the unit. The mode selector switch was set on "pilot". On the first and second flights, the pilot attempted to align the sights on the target and fire from a range of 1,500 meters. The upper limit switches prevented firing under these conditions and the pilot fired at some shorter range dictated by the pods coming back into limits. On the third and fourth flights the pilot set the pods to a position just below the upper limits and fired

when the sights were on target without moving the sights.

For the 24-pair ripple the same inputs to the fire control unit were used as for the six-pair ripples except the scheduled air speed was 60 knots and the limit switches were bypassed. The pilot fired when approximately 1,500 meters from the target. The rocket in tube no. 4 on the right pod did not fire. The firing voltage to the pod checked good. The rocket circuit also checked good and time did permit a thorough check to determine the cause of the failure. However, since that time over 200 rounds have been fired from the launchers with no other misfires.

The data obtained from these firings are presented in Table IV. As noted no data were obtained in the vertical plane on any flights due to a bad accelerometer and lack of time to change the instrument.

VI. SUMMARY

During these tests of the XM3, HU-1B armament subassembly, the two launcher pods were jettisoned in flight under different conditions with only minor difficulty which was remedied after the first jettison.

The system was flight fired for accuracy under different conditions using appropriate inputs to the fire control unit. During the test it was determined that under certain conditions the fire control unit was not operating as desired. However, the test was completed since time did not permit a change to the unit during this portion of development and it was felt that sufficient data were being obtained whereby the trouble with the unit could be determined and a more knowledgable fix could be made in the future. This fix will be tested during the engineer-user tests. A final accuracy analysis of the system is being completed by the Guidance, Control and Aeroballistic Laboratory, Redstone Arsenal, Alabama, and will be presented in a seperate report.

The structural integrity of the system hardware proved adequate throughout these tests.

Appendix I

UNUSUAL TERMS AND NONSTANDARD ABBRIVIATIONS

ADL	Armament Datum Line.
Autorotation	Helicopter descent and/or landing without use of rotor power.
CG	Center of Gravity.
QE	Quadrant Elevation.
2.75-inch FFAR	2.75-inch Folding Fin Aircraft Rocket
Split Mode	Sight elevation is maintained remotely by the co-pilot. The pilot maintains an azimuth and the firing. (Both sights are operative).
Pilot Mode	The pilot has full control. He maintains both azimuth and sight elevation. He also does the firing. (Only the pilots sight is operative).
Smoke-Head	An Inert Rocket Head that has been modified to contain a bottle of liquid smoke (Titanium-Tetrachloride).
Accuracy	Rocket impact location as compared to computer setting.

Table I

SCHEDULE OF FIRINGS AS OUTLINED IN TEST PLAN 5.b. PARAGRAPH 3.b.(2)(Ref. 1)

Velocity, knots	Altitude, meters	Range, meters	Type firing	No. of pairs
90	50	1,200	Single pair	12
60	50	1,200	Single pair	12
30	50	1,200	Single pair	12
90	50	1,800	Ripple (6 pair)	6
60	50	1,800	Ripple (6 pair)	6
30	50	1,800	Ripple (6 pair)	6
90	50	1,200	Ripple (6 pair)	6
60	50	1,200	Ripple (6 pair)	6
30	50	1,200	Ripple (6 pair)	6
90	50	600	Ripple (6 pair)	6
60	50	600	Ripple (6 pair)	6
30	50	600	Ripple (6 pair)	6
90	100	1,200	Ripple (6 pair)	6
60	100	1,200	Ripple (6 pair)	6
30	100	1,200	Ripple (6 pair)	6
90	10	1,800	Ripple (6 pair)	6
60	10	1,800	Ripple (6 pair)	6
30	10	1,800	Ripple (6 pair)	6
Paragraph 3.b (1)				
90	100	1,800	Ripple (24 pair)	24
60	100	1,800	Ripple (24 pair)	24
Hover		1,800	Ripple (24 pair)	24

Table II. SCHEDULE OF ROCKETS FIRED ON TEST 5.b

Velocity, knots	Altitude, meters	Range, meters	Type firing	Flight no.	No. of pairs, total	Remarks
90	50	1,200	Single pair	1	1	Fired one pair before it was known that this condition could not be met because computer was cut out by shorting plug.
60	50	1,200	Single pair	5 through 10 12 through 19 21 through 34	28	Fired extra pairs because impact data were not obtained from initial tests.
60	50	1,200	Ripple (6 pair)	11, 41	12	Fired extra ripple because sufficient impact data were not obtained on first ripple.
60	50	1,200	Ripple (18 pair)	20	16	A nonscheduled firing. Done primarily to give pilot feel of helicopter when firing a long ripple.
30	50	1,200	Single pair	35 through 40 44 through 50	13	Needed data not obtained on one pair. Fired extra.
30	50	1,200	Ripple (6 pair)	66	6	As scheduled.
90	50	600	Single pair	51 through 63	13	This firing conducted in lieu of 90 knots, 50 meters and 1,200 meter range.
90	50	600	Ripple (6 pair)	43	6	As scheduled.
60	50	600	Ripple (6 pair)	67	6	As scheduled.
90	50	1,800	Single pair	2	1	Fired to check impact data coverage.
60	50	1,800	Single pair	3	1	Fired to check impact data coverage.
60	50	1,800	Ripple (6 pair)	4, 42	12	Fired two ripples because needed data were not obtained on first ripple.
30	50	1,800	Ripple (6 pair)	64, 65	8	Fired second ripple because only 2 pairs fired on first ripple.
90	100	1,200	Ripple (6 pair)	69, 70	12	Fired second ripple. On board recorder off on first ripple.
60	100	1,200	Ripple (6 pair)	68	6	As scheduled.
60	10	1,800	Ripple (6 pair)	73	6	As scheduled
30	10	1,800	Ripple (6 pair)	72	6	As scheduled.
30	10	1,200	Ripple (6 pair)	71	6	Nonscheduled. Fired to obtain additional data.
90	10	600	Ripple (6 pair)	74	5	Nonscheduled. Fired in lieu of 90 knots velocity, 10 meters altitude, 1,800 meters range.
30	10	600	Ripple (6 pair)	76	2	Nonscheduled. Fired in lieu of 30 knots, 50 meters altitude, 600 meters range.
60	100	1,800	Ripple (24 pair)	77	10	As scheduled. Firing voltage interrupted by upper limit switches after 10 pair.
90	100	1,200	Ripple (24 pair)	79	24	Nonscheduled. Fired in lieu of 90 knots, 100 meters altitude, 1,800 meters range.
60	100	1,200	Ripple (24 pair)	78	24	Nonscheduled. Fired in lieu of 60 knots, 100 meter altitude, 1,800 meters range.
Hover	4	1,800	Ripple (24 pair)	75	24	As scheduled.

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Flight number	Firing date-1962	Firing time, hours	Input to fire control unit: Range, meters	Air speed, knots	Altitude, meters	Number of pairs fired	Mode selection	Tubes fired	Aircraft position data •: Distance to target when firing, meters	Lateral distance from ℄ when firing/ meters	Altitude from zero firing/ meters	Actual air speed, knots	Left pod elevation from ADL, mils
1	15 June	0607	1,200	90	50	1	Pilot	24					
2	15 June	0645	1,800	90	50	1	Split	24					
3	15 June	0728	1,800	60	50	1	Split	24					
4 (1)	15 June	0757	1,800	60	50	6	Split	19-24	1,845	0.55 Left	55.2	56.3	70.77 Up
(2)									1,843	0.55 Left	55.2	56.3	69.43 Up
(3)									1,839	0.55 Left	55.2	56.3	71.95 Up
(4)									1,834	0.55 Left	55.2	56.3	68.72 Up
(5)									1,830	0.55 Left	55.2	56.3	70.05 Up
(6)									1,823	0.55 Left	55.2	56.3	114.33 Up
5	19 June	0600	1,200	60	50	1	Split	1					
6	19 June	0642	1,200	60	50	1	Split	2					
7	19 June	0652	1,200	60	50	1	Split	3					
8	19 June	0716	1,200	60	50	1	Split	4	1,253.01	2.88 Right	50.09	74.2	71.04 Up
9	19 June	0753	1,200	60	50	1	Split	5	1,256.11	3.35 Right	57.17	61.2	67.23 Up
10	19 June	0758	1,200	60	50	1	Split	6					
11 (1)	19 June	0848	1,200	60	50	6	Split	7-12	1,261.2	5.06 Right	52.50	62.7	45.6 Up
(2)									1,256.1	5.22 Right	52.20	62.7	45.6 Up
(3)									1,251.2	5.05 Right	52.00	62.7	46.8 Up
(4)									1,245.9	4.95 Right	51.68	62.7	45.6 Up
(5)									1,240.4	4.93 Right	51.57	62.7	54.8 Up
(6)									1,231.2	4.62 Right	50.92	62.7	89.1 Up
12	19 June	1047	1,200	60	50	1	Split	13	1,261.27	4.04 Right	57.60	70.2	52.7 Up
13	19 June	1054	1,200	60	50	1	Split	14	1,192.33	12.46 Right	58.92	69.4	11.75 Up
14	21 June	0609	1,200	60	50	1	Split	19					
15	21 June	0717	1,200	60	50	1	Split	20	1,219.57	4.55 Right	79.19	67.0	50.8 Up
16	21 June	0725	1,200	60	50	1	Split	21	1,277.47	0.97 Right	86.89	61.5	36.88 Up
17	21 June	0738	1,200	60	50	1	Split	22	1,262.87	4.28 Left	81.76	70.3	32.26 Up
18	21 June	0743	1,200	60	50	1	Split	23					
19	21 June	0752	1,200	60	50	1	Split	24					
20 (1)	21 June	0823	1,200	60	50	18	Split	1-18	1,233.7	1.18 Right	36.33	69.9	68.30 Up
(2)									1,228.0	1.24 Right	36.31	69.9	66.24 Up
(3)									1,222.0	1.16 Right	36.27	69.9	67.06 Up
(4)									1,216.8	1.10 Right	36.23	69.9	64.19 Up
(5)									1,211.0	1.02 Right	36.00	69.9	67.27 Up
(6)									1,196.0	0.93 Right	35.45	69.9	112.58 Up
21	9 July	0805	1,200	60	50	1	Split	19	1,227.6	0.7 Left	64.00	62.4	91.3 Up
22	9 July	0811	1,200	60	50	2	Split	20-21					
23	9 July	1100	1,200	60	50	1	Split	19	1,287.0	3.4 Right	62.0	57.7	23.8 Up
24	9 July	1105	1,200	60	50	1	Split	20	1,291.5	0.7 Right	72.2	57.1	27.2 Up
25	9 July	1110	1,200	60	50	1	Split	21	1,281.9	0.8 Left	57.4	58.5	57.8 Up
26	9 July	1115	1,200	60	50	1	Split	22	1,211.9	1.4 Left	59.0	60.9	66.4 Up
27	9 July	1120	1,200	60	50	1	Split	23					
28	9 July	1128	1,200	60	50	1	Split	24					
29	10 July	0755	1,200	60	50	1	Split	19	1,261.7	3.8 Left	59.2	58.3	55.0 Up
30	10 July	0800	1,200	60	50	1	Split	20	1,259.4	2.0 Left	59.4	66.8	50.2 Up

• Time of flight is measured from first ignition to impact of first and last round.

Table III. ROCKET FIRING CONDITIONS.

ltitude from zero firing/ meters	Actual air speed, knots	Left pod elevation from ADL, mils	Right pod elevation from ADL, mils	Left sight with respect to ADL of ship/ degree	Right sight with respect to ADL of ship/ degree	Aircraft attitude (ADL) data: Pitch in degrees	Pitch velocity, deg/sec	Pitch acceleration degrees/ sec/sec	Aircraft attitude (¢) data: Yaw degrees	Yaw velocity, degree/sec	Yaw acceleration degrees/ sec/sec	Rocket flight time in secs	X Ax (from r C) in m
55.2	56.3	70.77 Up	56.92 Up	2.49 Down	2.53 Down	0.70 Down	1.00 Up	-1.5	0.05 Left	0.80 Left	-1.2	3.105	1,97
55.2	56.3	69.43 Up	56.38 Up	2.46 Down	2.53 Down	0.63 Down	0.76 Up	-5.3	0.09 Left	0.70 Left	-2.0		1,99
55.2	56.3	71.95 Up	82.00 Up	2.56 Down	2.61 Down	0.60 Down	0.75 Down	15.2	0.20 Left	0.35 Left	-3.4		1,87
55.2	56.3	68.72 Up	47.77 Up	2.25 Down	2.28 Down	0.90 Down	3.10 Down	12.6	0.20 Left	0.30 Left	4.5	3.597	2,12
55.2	56.3	70.05 Up	67.76 Up	1.69 Down	1.79 Down	1.46 Down	4.55 Down	8.0	0.09 Left	1.02 Right	5.3		
55.2	56.3	114.33 Up	107.42 Up	0.29 Down	0.30 Down	2.7 Down	5.83 Down	2.7	0.37 Right	2.43 Right	5.7		1,645
												2.173 2.405 2.210	995 1,153 1,02
50.09	74.2	71.04 Up	71.11 Up	2.08 Down	0.97 Down	0.09 Down	0.4 Up	1.2	1.0 Left	0.7 Left	6.0 Right	2.376 2.441	1,10
57.17	61.2	67.23 Up	67.16 Up	1.06 Down	1.11 Down	1.14 Down	0.2 Up	0.0	1.5 Right	1.1 Left	0.8 Right	2.467	1,19
52.50	62.7	45.6 Up	46.14 Up	1.81 Down	1.85 Down	0.64 Down	0.33 Down	1.0	1.3 Right	0.20 Right	0.0	2.159	1,13
52.20	62.7	45.6 Up	43.6 Up	1.91 Down	1.93 Down	0.53 Down	0.43 Down	1.4	1.3 Right	0.20 Right	0.0		1,1[illegible]
52.00	62.7	46.8 Up	42.1 Up	1.81 Down	1.85 Down	0.72 Down	0.57 Down	2.5	1.26 Right	0.20 Right	0.0		1,20
51.68	62.7	45.6 Up	37.3 Up	1.45 Down	1.60 Down	0.87 Down	2.88 Down	16.0	1.40 Right	0.20 Right	0.0		1,17
51.57	62.7	54.8 Up	54.2 Up	1.0 Down	1.28 Down	1.50 Down	4.82 Down	9.2	1.60 Right	0.23 Right	2.0		1,06
50.92	62.7	89.1 Up	87.9 Up	0.45 Up	0.0	3.15 Down	6.68 Down	4.8	1.75 Right	1.84 Right	9.8	3.152	1,09
57.60	70.2	52.7 Up	51.7 Up	1.46 Down	1.55 Down	0.29 Down	0.3 Up	2.0	1.75 Right	1.3 Left	1.6	2.273 2.149	1,05 1,15
58.92	69.4	11.75 Up	13.15 Up	3.14 Down	3.08 Down	0.86 Up	0.5 Down	2.0	2.3 Right	0.11 Right	2.0	2.263 2.274	1,17 1,18
													[illegible] 1,24
79.19	67.0	50.8 Up	50.4 Up	2.24 Down	2.27 Down	0.06 Down	0.4 Down	13.6	0.9 Right	0.45 Left	2.0	2.696	1,40
86.89	61.5	36.88 Up	28.19 Up	3.35 Down	3.24 Down	0.06 Down	0.54 Up	12.0	0.9 Right	1.3 Left	-23.8	2.594	1,22
81.76	70.3	32.26 Up	26.85 Up	2.71 Down	2.65 Down	0.34 Down	0.20 Up	9.6	0.35 Right	0.13 Left	6.5	2.210 2.714	1,35
													1,35 1,29
36.33	69.9	68.30 Up	62.17 Up	1.60 Down	1.65 Down	0.94 Down	0.02 Down	0.24	0.05 Right	0.58 Left	1.72	2.291	1,23 1,23
36.31	69.9	66.24 Up	55.68 Up	1.63 Down	1.67 Down	0.89 Down	0.15 Down	0.78	0.30 Left	0.90 Left	3.01		1,14
36.27	69.9	67.06 Up	57.30 Up	1.50 Down	1.56 Down	0.94 Down	0.82 Down	19.87	0.40 Left	1.49 Left	4.81		1,26
36.23	69.9	64.19 Up	54.32 Up	1.09 Down	1.23 Down	1.28 Down	3.54 Down	15.12	0.74 Left	2.11 Left	3.38		1,15
36.00	69.9	67.27 Up	67.59 Up	0.63 Down	0.78 Down	1.71 Down	5.3 Down	7.61	1.05 Left	2.40 Left	0.71		1,19
35.45	69.9	112.58 Up	106.53 Up	1.36 Up	1.36 Up	3.70 Down	2.28 Down	-13.75	1.99 Left	1.39 Left	-4.31	5.856	1,18
													1,19 1,23 1,20 1,243 1,23
64.00	62.4	91.3 Up	89.7 Up	0.1 Up	0.2 Down	2.7 Down	1.3 Down	-37.5	0.3 Right	3.6 Right	28.5	2.517 2.687	1,24 1,29
62.0	57.7	23.8 Up	12.6 Up	3.3 Down	3.3 Down	0.6 Down	0.7 Up	34.5	1.7 Left	1.9 Right	-5.0	2.426 2.559	1,23 1,14
72.2	57.1	27.2 Up	13.8 Up	3.2 Down	3.2 Down	0.1 Down	0.0	0.0	1.7 Right	0.3 Left	-2.5	2.411 2.715	1,23 1,17
57.4	58.5	57.8 Up	50.1 Up	2.2 Down	2.2 Down	0.4 Down	0.3 Up	32.0	2.1 Right	0.0	0.0	2.828 2.906	1,41 1,42
59.0	60.9	66.4 Up	56.1 Up	1.5 Down	1.3 Down	1.8 Down	0.3 Up	29.5	0.1 Left	0.0	0.0	2.500 3.535	1,34 1,86
													1,67 1,12
59.2	58.3	55.0 Up	31.5 Up	1.9 Down	2.0 Down	1.1 Down	0.3 Up	-6.75	2.7 Right	1.5 Left	-54.00	2.370 2.393	1,13 1,05
59.4	66.8	50.2 Up	28.8 Up	2.6 Down	2.7 Down	0.1 Down	0.0	0.0	0.5 Right	0.0	0.0	2.580 3.386	1,27 1,70

Table III. ROCKET FIRING CONDITIONS.

Left pod elevation from ADL, mils	Right pod elevation from ADL, mils	Left sight with respect to ADL of ship/ degree	Right sight with respect to ADL of ship/ degree	Aircraft attitude (ADL) data: Pitch in degrees	Pitch velocity, deg/sec	Pitch acceleration degrees/ sec sec	Aircraft attitude (ϕ) data: Yaw degrees	Yaw velocity, degree/sec	Yaw acceleration degrees/ sec, sec	Rocket flight time in sec*	Impact: X Axis (from range 0) in meters
70.77 Up	56.92 Up	2.49 Down	2.53 Down	0.70 Down	1.00 Up	-1.5	0.05 Left	0.69 Left	-1.2	3.108	1,972.4
69.43 Up	56.38 Up	2.46 Down	2.53 Down	0.63 Down	0.78 Up	-5.3	0.09 Left	0.70 Left	-2.0		1,905.2
71.95 Up	52.00 Up	2.56 Down	2.61 Down	0.60 Down	0.75 Down	15.2	0.20 Left	0.35 Left	-3.4		1,879.1
68.72 Up	47.77 Up	2.25 Down	2.28 Down	0.90 Down	3.10 Down	12.6	0.20 Left	0.30 Left	8.5	3.597	2,128.6
70.05 Up	67.76 Up	1.69 Down	1.79 Down	1.46 Down	4.58 Down	8.0	0.09 Left	1.02 Right	5.3		
114.33 Up	107.42 Up	0.29 Down	0.30 Down	2.7 Down	5.83 Down	2.7	0.37 Right	2.43 Right	5.7		1,646.4
										2.173	995.4
										2.405	1,183.9
71.04 Up	71.11 Up	1.08 Down	0.97 Down	0.09 Down	0.4 Up	1.2	1.0 Left	0.7 Left	6.0 Right	2.210	1,023.3
67.23 Up	67.16 Up	1.05 Down	1.11 Down	1.14 Down	0.2 Up	0.0	1.5 Right	1.1 Left	0.8 Right	2.378	1,190.0
										2.441	1,191.1
										2.467	
45.6 Up	46.14 Up	1.81 Down	1.85 Down	0.64 Down	0.33 Down	1.0	1.3 Right	0.20 Right	0.0	2.159	1,138.3
45.6 Up	43.6 Up	1.91 Down	1.93 Down	0.53 Down	0.43 Down	1.4	1.3 Right	0.20 Right	0.0		1,186.2
46.8 Up	42.1 Up	1.81 Down	1.85 Down	0.72 Down	0.57 Down	2.5	1.26 Right	0.20 Right	0.0		1,202.9
45.6 Up	37.3 Up	1.45 Down	1.60 Down	0.87 Down	2.88 Down	16.0	1.40 Right	0.20 Right	0.0		1,175.3
54.8 Up	54.2 Up	1.0 Down	1.28 Down	1.50 Down	4.82 Down	9.2	1.60 Right	0.23 Right	2.0		1,063.3
89.1 Up	87.9 Up	0.45 Up	0.0	3.15 Down	6.68 Down	4.8	1.75 Right	1.84 Right	9.8	3.152	1,099.2
52.7 Up	51.7 Up	1.46 Down	1.55 Down	0.29 Down	0.3 Up	2.0	1.75 Right	1.3 Left	1.6	2.273	1,059.0
										2.149	1,159.3
11.75 Up	13.15 Up	3.14 Down	3.08 Down	0.86 Up	0.5 Down	2.0	2.3 Right	0.11 Right	2.0	2.263	1,176.3
										2.274	1,186.6
											1,185.3
											1,243.2
50.8 Up	50.4 Up	2.24 Down	2.27 Down	0.06 Down	0.4 Down	13.6	0.9 Right	0.45 Left	2.0	2.696	1,408.3
36.88 Up	26.19 Up	3.35 Down	3.24 Down	0.06 Down	0.54 Up	12.0	0.9 Right	1.3 Left	-28.8	2.594	1,222.9
32.26 Up	26.85 Up	2.71 Down	2.65 Down	0.34 Down	0.20 Up	9.6	0.35 Right	0.13 Left	6.5	2.210	1,354.1
										2.714	1,338.9
											1,296.9
68.30 Up	62.17 Up	1.60 Down	1.65 Down	0.94 Down	0.02 Down	0.24	0.05 Right	0.58 Left	1.72	2.291	1,233.2
66.24 Up	55.68 Up	1.63 Down	1.67 Down	0.89 Down	0.15 Down	0.78	0.30 Left	0.90 Left	3.01		1,232.9
67.06 Up	57.30 Up	1.50 Down	1.56 Down	0.94 Down	0.82 Down	19.87	0.40 Left	1.49 Left	4.81		1,149.9
64.19 Up	54.32 Up	1.09 Down	1.23 Down	1.28 Down	3.54 Down	15.12	0.76 Left	2.11 Left	3.38		1,266.4
67.27 Up	67.59 Up	0.63 Down	0.78 Down	1.71 Down	5.3 Down	7.61	1.05 Left	2.40 Left	0.71		1,153.4
112.58 Up	106.53 Up	1.36 Up	1.38 Up	3.70 Down	2.28 Down	-13.75	1.99 Left	1.39 Left	-4.31	5.856	1,195.0
											1,181.6
											1,199.4
											1,239.1
											1,204.5
											1,243.4
											1,238.4
91.3 Up	69.7 Up	0.1 Up	0.2 Down	2.7 Down	1.3 Down	-37.5	0.3 Right	3.6 Right	26.5	2.517	1,244.4
										2.681	1,297.4
23.8 Up	12.6 Up	3.3 Down	3.3 Down	0.6 Down	0.7 Up	34.5	1.7 Left	1.9 Right	-5.0	2.426	1,230.
27.3 Up	13.8 Up	3.2 Down	3.2 Down	0.1 Down	0.0	0.0	1.7 Right	0.3 Left	-2.5	2.559	1,142.
										2.411	1,234.
										2.715	1,177.
57.8 Up	50.1 Up	2.2 Down	2.2 Down	0.4 Down	0.3 Up	32.0	2.1 Right	0.0	0.0	2.828	1,415.
										2.908	1,420.
66.4 Up	56.1 Up	1.5 Down	1.3 Down	1.8 Down	0.3 Up	29.5	0.1 Left	0.0	0.0	2.500	1,343.
										3.535	1,869.
											1,674.
											1,123.
55.0 Up	31.5 Up	1.9 Down	2.0 Down	1.1 Down	0.3 Up	-6.75	2.7 Right	1.5 Left	-54.00	2.370	1,134.
										2.393	1,051.
50.2 Up	28.8 Up	2.6 Down	2.7 Down	0.1 Down	0.0	0.0	0.5 Right	0.0	0.0	2.580	1,271.
										3.386	1,706.

Impact data				
X Axis (from range) in meters	Y Axis (from range ℄) in meters	Pilots reported sight position	Type heads	Remarks
		No report	H. E.	No data
		No report	H. E.	No data
		No report	H. E.	No data
1,972.4	21.9 Right	No report	H. E.	
1,905.2	103.2 Right			
1,879.1	83.8 Right			
2,128.6	93.4 Right			
1,646.4	1.6 Left	Slightly left	H. E.	Chase pilot photographed wrong target
		On target	H. E.	Chase pilot photographed wrong target
995.4	4.6 Right	On target	H. E.	Incomplete data
1,183.9	18.5 Left			
1,023.3	4.9 Left	On target	H. E.	
1,190.0	2.5 Right	On target	H. E.	
1,191.1	29.7 Left			
		On target	H. E.	No data
1,136.3	23.9 Left	On target	H. E.	
1,186.2	10.4 Left			
1,202.9	15.2 Left			
1,175.3	18.8 Left			
1,063.3	10.0 Left			
1,099.2	6.6 Right			
1,059.0	57.1 Left			
1,159.3	70.8 Left	On target	H. E.	
1,176.3	6.2 Left	On target	H. E	
1,186.8	27.5 Left			
1,185.3	3.1 Right	On target	H. E.	Incomplete data
1,243.2	30.1 Right			
1,408.3	6.4 Right	On target	H. E.	
1,222.9	8.3 Right	On target	H. E.	
1,354.1	52.9 Left	Slightly left	H. E.	
1,338.9	21.1 Left	On target	H. E.	Incomplete data
1,296.9	28.3 Right	Slightly right	H. E.	Incomplete data
1,233.2	6.9 Right	No report	H. E.	Fired 16 pair but firing was interrupted after approximately 8 pair.
1,232.9	18.9 Left			
1,149.9	9.9 Left			
1,266.4	7.3 Left			
1,153.4	33.1 Left			Fired 5 more pair when about 200 meters down range.
1,195.0	9.4 Right			
1,181.6	11.7 Left			Two pair fired on another flight.
1,199.6	7.5 Right			
1,239.1	15.9 Left			
1,204.5	4.9 Right			
1,243.6	12.3 Left			
1,238.6	28.6 Right			
1,244.9	42.8 Left	Five mils left	Smoke	
1,297.6	49.4 Left	Five mils left	Smoke	Scheduled one pair firing limit switch cut out. No data
1,230.5	22.4 Left	On target	Smoke	
1,142.4	36.1 Left			
1,234.3	75.2 Left	Five mils left	Smoke	
1,177.2	310.7 Left			
1,415.5	11.8 Left	Ten mils right	Smoke	
1,420.3	20.4 Left			
1,343.8	35.7 Left	On target	Smoke	
1,869.1	35.5 Right	Five mils low	Smoke	Incomplete data
1,674.4	37.4 Left	Five mils right	Smoke	Incomplete data
1,123.4	23.6 Left	Five mils low	Smoke	
1,134.3	22.8 Right	On target	Smoke	
1,051.6	0.0			
1,271.8	21.5 Right	Five mils left	Smoke	
1,706.2	47.3 Left			

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Flight numbers	Firing date - 1962	Firing time, hours	Range, meters	Input to fire control unit: Air speed knots	Altitude, meters	Number of pairs fired	Mode selection	Aircraft position data •: Tubes fired	Distance to target when firing, meters	Lateral distance from ℄ when firing, meters	Altitude from zero firing, meters	Actual air speed, knots	Left pod elevation from ADL, mils
31	10 July	0803	1,200	60	50	1	Split	21	1,235.7	8.6 Left	58.6	73.0	51.7 Up
32	10 July	0807	1,200	60	50	1	Split	22	1,270.0	8.2 Left	54.9	66.8	80.9 Up
33	10 July	0811	1,200	60	50	1	Split	23	1,253.9	9.1 Left	57.9	75.0	61.2 Up
34	10 July	0816	1,200	60	50	1	Split	24	1,260.2	7.1 Left	54.3	67.5	69.7 Up
35	10 July	0900	1,200	30	50	1	Split	19	1,252.4	13.0 Left	56.0	45.9	10.2 Up
36	10 July	0908	1,200	30	50	1	Split	20	1,254.2	13.1 Left	53.5	60.9	35.6 Up
37	10 July	0913	1,200	30	50	1	Split	21	1,216.4	5.0 Left	47.6	38.0	9.4 Up
38	10 July	1105	1,200	30	50	1	Split	20	1,254.4	0.1 Left	44.1	32.1	20.5 Up
39	10 July	1108	1,200	30	50	1	Split	21	1,251.5	1.8 Left	50.8	29.7	2.4 Down
40	10 July	1112	1,200	30	50	1	Split	22	1,258.4	1.5 Right	46.5	29.7	1.5 Down
41 (1)	31 July	0832	1,200	60	50	6	Split	19-24	1,241.	0.39 Right	66.2	48.6	35.0 Up
(2)									1,237.	0.38 Right	66.3	49.2	33.8 Up
(3)									1,233.	0.43 Right	66.3	48.9	30.8 Up
(4)									1,230.	0.50 Right	66.5	48.4	28.9 Up
(5)									1,226.	0.58 Right	66.6	47.3	55.5 Up
(6)									1,222.	0.58 Right	66.6	49.1	94.8 Up
(7)													
(8)													
(9)													
(10)													
42 (1)	31 July	0907	1,800	60	50	6	Split	19-24	1,846.	3.54 Left	70.7	58.3	64.3 Up
(2)									1,842.	3.62 Left	70.7	58.4	63.2 Up
(3)									1,837.	3.72 Left	70.7	60.6	63.1 Up
(4)									1,833.	3.65 Left	70.8	58.9	63.7 Up
(5)									1,829.	3.70 Left	70.7	60.3	79.6 Up
(6)									1,824.	3.86 Left	70.7	60.2	95.5 Up
(7)													
(8)													
(9)													
(10)													
(11)													
43 (1)	31 July	0942	600	90	50	6 - 1 round	Split	19-24					
44	1 August	0752	1,200	30	50	1	Split	7	1,233.	2.29 Left	47.5	25.3	13.5 Down
45	1 August	0758	1,200	30	50	1	Split	8	1,243.	8.49 Left	43.3	29.9	19.5 Up
46	1 August	0803	1,200	30	50	1	Split	9					
47	1 August	0851	1,200	30	50	1	Split	10	1,236.	3.03 Left	63.9	36.9	5.7 Up
48	1 August	0857	1,200	30	50	1	Split	11	1,259.	4.34 Left	68.5	30.7	10.6 Down
49	1 August	0903	1,200	30	50	1	Split	12	1,258.	9.00 Left	61.0	29.9	0.6 Up
50	2 August	0713	1,200	30	50	1	Split	6	1,256.	4.77 Left	55.8	30.3	5.9 Down

• Time of flight is measured from first ignition to impacts of first and last round.

Table III. (Continued)

...tual ...ir ...ead, ...nots	...eft pod elevation from ADL, mils	Right pod elevation from ADL, mils	Left sight with respect to ADL of ship/ degree	Right sight with respect to ADL of ship/ degree	Aircraft attitude (ADL) data: Pitch in degrees	Pitch velocity, deg/sec	Pitch acceleration degrees/ sec/sec	Aircraft attitude (ξ) data: Yaw degrees	Yaw velocity, degree/sec	Yaw acceleration degrees/ sec/sec	Rocket flight time in sec.	X Ax (from ... 0) in m	...sition data.: Lateral distance from ξ when firing/ meters	Altitu... from ... firin... meter
.0	51.7 Up	30.2 Up	2.8 Down	2.8 Down	0.2 Down	0.0	0.0	2.9 Right	0.0	0.0	2.490	1,235	8.6 Left	58.6
											2.567	1,302		
.8	80.9 Up	67.1 Up	1.1 Down	1.2 Down	1.6 Down	0.3 Up	-3.5	2.8 Right	0.3 Left	2.5	2.491	1,255	8.2 Left	54.9
											2.538	1,247		
.0	61.2 Up	40.4 Up	2.4 Down	2.2 Down	1.1 Down	0.4 Up	-2.5	4.2 Right	0.0	0.0	3.528	1,832	9.1 Left	57.9
											3.607	1,798		
.5	69.7 Up	48.5 Up	1.9 Down	1.9 Down	0.4 Down	0.0	0.0	3.3 Right	0.0	0.0	2.657	1,313	7.1 Left	54.3
											2.680	1,329		
.9	10.2 Up	1.1 Down	4.0 Down	4.2 Down	0.5 Up	0.2 Up	0.0	5.8 Right	2.3 Right	50.0	2.304	1,147	13.0 Left	56.0
											2.412	1,104		
.9	35.6 Up	29.4 Up	2.7 Down	2.9 Down	0.9 Up	0.5 Down	15.0	4.3 Right	0.9 Right	0.0	2.358	1,146	13.1 Left	53.5
											2.419	1,114		
.0	9.4 Up	10.2 Up	3.6 Down	3.8 Down	0.2 Up	0.0	0.0	1.2 Right	0.0	0.0	2.257	1,142	5.0 Left	47.6
											2.334	1,077		
.1	20.5 Up	12.0 Up	3.3 Down	3.5 Down	0.4 Up	0.0	0.0	0.0	0.2 Right	28.5	1.933	1,099	0.1 Left	44.1
											1.993	882		
.7	2.4 Down	5.0 Down	5.1 Down	5.1 Down	1.7 Up	0.0	0.0	2.6 Right	0.0	0.0	2.338	1,236	1.8 Left	50.8
											2.535	1,147		
.7	1.5 Down	0.6 Down	3.7 Down	3.9 Down	0.1 Down	0.0	0.0	0.0	0.0	0.0	1.994	1,039	1.5 Right	46.5
.6	35.0 Up	29.9 Up	2.5 Down	2.7 Down	0.4 Down	0.1 Down	1.8	3.4 Left	3.5 Right	5.6	2.263	989	0.39 Right	66.2
.2	33.8 Up	25.5 Up	2.7 Down	2.5 Down	0.5 Down	0.6 Down	5.0	2.7 Left	4.3 Right	2.4	2.494	1,206	0.38 Right	66.3
.9	30.8 Up	21.8 Up	2.6 Down	2.7 Down	0.6 Down	1.4 Down	9.6	2.4 Left	4.3 Right	-1.3		1,199	0.43 Right	66.3
.4	28.9 Up	21.8 Up	1.5 Down	1.8 Down	1.0 Down	3.8 Down	12.8	1.7 Left	3.7 Right	-5.6		1,160	0.50 Right	66.5
.3	55.5 Up	47.0 Up	0.3 Up	0	1.7 Down	5.2 Down	6.8	1.3 Left	2.3 Right	-18.6		1,157	0.58 Right	66.6
.1	94.8 Up	87.7 Up	1.5 Up	1.5 Up	2.4 Down	5.5 Down	0.2	1.2 Left	0.0	0		1,287	0.58 Right	66.6
												1,346		
												1,394		
												1,750		
												1,879		
.3	64.3 Up	55.3 Up	1.7 Down	1.9 Down	0.2 Down	0.4 Down	0.0	2.9 Right	2.4 Right	7.7	4.141	2,207	3.54 Left	70.7
.4	63.2 Up	55.3 Up	1.8 Down	1.8 Down	0.2 Down	0.4 Down	2.7	3.2 Right	3.1 Right	2.5	3.619	1,851	3.62 Left	70.7
.6	63.1 Up	54.2 Up	1.8 Down	1.9 Down	0.3 Down	1.4 Down	11.0	3.8 Right	2.7 Right	-7.6		1,862	3.72 Left	70.7
.9	63.7 Up	52.7 Up	1.3 Down	1.5 Down	0.6 Down	3.1 Down	10.4	4.0 Right	1.9 Right	-3.2		1,854	3.65 Left	70.8
.3	79.6 Up	72.4 Up	0.4 Down	0.5 Down	1.2 Down	4.4 Down	6.0	4.3 Right	1.7 Right	-0.8		1,861	3.70 Left	70.7
.2	95.5 Up	86.3 Up	0.3 Up	0.2 Up	1.9 Down	4.7 Down	0.2	4.5 Right	1.5 Right	-1.4		1,872	3.86 Left	70.7
												2,050		
												2,049		
												2,132		
												2,130		
												2,297		
											5.217	2,310		
												700		
												684		
												634		
												643		
												589		
												601		
												506		
												521		
												464		
												474		
												513		
.3	13.5 Down	11.1 Down	4.7 Down	5.0 Down	1.8 Up	0.0	0.0	2.1 Right	2.8 Right	0.0	2.203	1,360	2.29 Left	47.5
.9	19.5 Up	7.1 Up	3.1 Down	3.3 Down	0.5 Up	0.4 Up	-15.0	9.7 Right	0.0	0.0	2.759	1,025		
											1.625	835	8.49 Left	43.3
											1.912	638		
												1,151		
.9	5.7 Up	0.2 Down	3.8 Down	3.8 Down	0.6 Up	0.0	0.0	1.1 Right	5.1 Right	36.0		1,140		
.7	10.8 Down	10.2 Down	4.7 Down	5.0 Down	1.5 Up	0.5 Down	5.0	1.6 Right	0.6 Right	-19.0	2.234	1,102	3.03 Left	63.9
											2.745	1,413		
.9	0.8 Up	3.0 Down	3.4 Down	3.7 Down	0.7 Up	0.0	0.0	7.1 Right	1.8 Right	9.0	2.338	1,125	4.34 Left	68.5
											2.362	1,068		
.3	5.9 Down	12.8 Down	4.4 Down	4.68 Down	1.5 Up	0.6 Down	10.0		10.0	0.0	2.320	1,243	9.00 Left	61.0
											2.769	1,112		
											1.906	1,056	4.77 Left	55.8
											2.318	831		

Table III. (Continued)

X Ax (from 0) in m	sition data • Lateral distance from ℄ when firing/ meters	Altitude from zero firing/ meters	Actual air speed, knots	Left pod elevation from ADL, mils	Right pod elevation from ADL, mils	Left sight with respect to ADL of ship/ degree	Right sight with respect to ADL of ship/ degree	Aircraft attitude (ADL) data: Pitch in degrees	Pitch velocity, deg/sec	Pitch acceleration degrees/ sec/sec	Aircraft attitude (℄) data: Yaw degrees	Yaw velocity, degree/sec	Yaw acceleration degrees/ sec/sec	fl i
1,235	8.6 Left	58.6	73.0	51.7 Up	30.2 Up	2.8 Down	2.8 Down	0.2 Down	0.0	0.0	2.9 Right	0.0	0.0	2
1,302														2
1,255	8.2 Left	54.9	66.8	80.9 Up	67.1 Up	1.1 Down	1.2 Down	1.6 Down	0.3 Up	-4.5	2.8 Right	0.3 Left	2.5	2
1,247														2
1,832	9.1 Left	57.9	75.0	61.2 Up	40.4 Up	2.4 Down	2.2 Down	1.1 Down	0.4 Up	-2.5	4.2 Right	0.0	0.0	3
1,796														3
1,313	7.1 Left	54.3	67.5	69.7 Up	48.5 Up	1.9 Down	1.9 Down	0.4 Down	0.0	0.0	3.3 Right	0.0	0.0	2
1,329														2
1,147	13.0 Left	56.0	45.9	10.2 Up	1.1 Down	4.0 Down	4.2 Down	0.5 Up	0.2 Up	0.0	5.8 Right	2.3 Right	50.0	2
1,104														2
1,146	13.1 Left	53.5	60.9	35.6 Up	29.4 Up	2.7 Down	2.9 Down	0.9 Up	0.5 Down	15.0	4.3 Right	0.9 Right	0.0	2
1,114														2
1,142	5.0 Left	47.6	38.0	9.4 Up	10.2 Up	3.6 Down	3.8 Down	0.2 Up	0.0	0.0	1.2 Right	0.0	0.0	2
1,077														1
1,099	0.1 Left	44.1	32.1	20.5 Up	12.0 Up	3.3 Down	3.5 Down	0.4 Up	0.0	0.0	0.0	0.2 Right	28.5	1
882														2.
1,236	1.8 Left	50.8	29.7	2.4 Down	5.0 Down	5.1 Down	5.1 Down	1.7 Up	0.0	0.0	2.6 Right	0.2	0.0	2
1,147														2
1,039	1.5 Right	46.5	29.7	1.5 Down	0.6 Down	3.7 Down	3.9 Down	0.1 Down	0.0	0.0	0.0	0.0	0.0	1.
989	0.39 Right	66.2	48.6	35.0 Up	29.9 Up	2.5 Down	2.7 Down	0.4 Down	0.1 Down	1.8	3.4 Left	3.5 Right	5.6	2.
1,206														
1,199	0.38 Right	66.3	49.2	33.8 Up	25.5 Up	2.7 Down	2.5 Down	0.5 Down	0.6 Down	5.0	2.7 Left	4.3 Right	2.4	
1,160	0.43 Right	66.3	48.9	30.8 Up	21.8 Up	2.6 Down	2.7 Down	0.6 Down	1.4 Down	9.6	2.4 Left	4.3 Right	-1.3	
1,157	0.50 Right	66.5	48.4	28.9 Up	21.8 Up	1.5 Down	1.8 Down	1.0 Down	3.8 Down	12.8	1.7 Left	3.7 Right	-5.6	
1,287	0.58 Right	66.6	47.3	55.5 Up	47.0 Up	0.3 Up	0	1.7 Down	5.2 Down	6.8	1.3 Left	2.3 Right	-18.6	
1,346	0.58 Right	66.6	49.1	94.8 Up	87.7 Up	1.5 Up	1.5 Up	2.4 Down	5.5 Down	0.2	1.2 Left	0.0	0	
1,394														
1,750														
1,879														
2,207														4.
1,851	3.54 Left	70.7	58.3	64.3 Up	55.3 Up	1.7 Down	1.9 Down	0.2 Down	0.4 Down	0.0	2.9 Right	2.4 Right	7.7	3.
1,862	3.62 Left	70.7	58.4	63.2 Up	55.3 Up	1.8 Down	1.8 Down	0.2 Down	0.4 Down	2.7	3.2 Right	3.2 Right	2.5	
1,854	3.72 Left	70.7	60.6	63.1 Up	54.2 Up	1.8 Down	1.9 Down	0.3 Down	1.4 Down	11.0	3.8 Right	2.7 Right	-7.6	
1,861	3.65 Left	70.8	58.9	63.7 Up	52.7 Up	1.3 Down	1.5 Down	0.6 Down	3.1 Down	10.4	4.0 Right	1.9 Right	-3.2	
1,872	3.70 Left	70.7	60.3	79.6 Up	72.4 Up	0.4 Down	0.5 Down	1.2 Down	4.4 Down	6.0	4.3 Right	1.7 Right	-0.8	
2,050	3.86 Left	70.7	60.2	95.5 Up	86.3 Up	0.3 Up	0.2 Up	1.9 Down	4.7 Down	0.2	4.5 Right	1.4 Right	-1.4	
2,049														
2,132														
2,130														
2,297														
2,310														5.
700														
684														
634														
643														
589														
601														
506														
521														
464														
474														
513														
1,360	2.29 Left	47.5	25.3	13.5 Down	11.1 Down	4.7 Down	5.0 Down	1.8 Up	0.0	0.0	2.1 Right	2.8 Right	0.0	2.
1,025														2.
835	8.49 Left	43.3	29.9	19.5 Up	7.1 Up	3.1 Down	3.3 Down	0.5 Up	0.4 Up	-15.0	9.7 Right	0.0	0.0	1.
638														1.
1,151														
1,140														
1,102	3.03 Left	63.9	36.9	5.7 Up	0.2 Down	3.8 Down	3.8 Down	0.6 Up	0.0	0.0	1.1 Right	5.1 Right	36.0	2.
1,413														2.
1,125	4.34 Left	68.5	30.7	10.8 Down	10.2 Down	4.7 Down	5.0 Down	1.5 Up	0.5 Down	5.0	1.6 Right	0.6 Right	-19.0	2.
1,068														2.
1,243	9.00 Left	61.0	29.9	0.8 Up	3.0 Down	3.4 Down	3.7 Down	0.7 Up	0.0	0.0	7.1 Right	1.8 Right	9.0	2.
1,112														2.
1,056	4.77 Left	55.8	30.3	5.9 Down	12.8 Down	4.4 Down	4.68 Down	1.5 Up	0.6 Down	10.0		0.0	0.0	1.
831														2.

titude (E) data			Impact data				
Yaw locity, ree/sec	Yaw accelera; tion degrees/ sec/sec	Rocket flight time in sec.	X Axis (from range 0) in meters	Y Axis (from range E) in meters	Pilots reported sight position	Type heads	Remarks
.0	0.0	2.490	1,235.3	19.2 Right	On target	Smoke	
		2.567	1,302.8	25.8 Left			
.3 Left	2.5	2.491	1,255.0	13.7 Left	Four mils left	Smoke	
		2.538	1,247.3	27.3 Left			
.0	0.0	3.528	1,832.5	9.9 Left	On target	Smoke	
		3.607	1,798.4	18.3 Right			
.0	0.0	2.657	1,313.2	42.6 Left	On target	Smoke	
		2.680	1,329.4	49.1 Right			
.3 Right	50.0	2.304	1,147.1	20.7 Right	On target	Smoke	
		2.412	1,104.6	1.0 Right			
.9 Right	0.0	2.358	1,146.5	29.3 Left	Five mils left	Smoke	
		2.419	1,114.4	20.9 Left			
.0	0.0	2.257	1,142.5	14.7 Left	On target	Smoke	
		2.334	1,077.8	1.6 Left			
.2 Right	28.5	1.933	1,099.0	3.5 Right	On target	Smoke	
		1.993	882.0	41.0 Right			
.?	0.0	2.338	1,236.1	17.1 Right	Ten mils right	Smoke	
		2.535	1,147.5	34.3 Right			
.0	0.0	1.994	1,039.3	21.2 Left	Ten mils low and Five mils left	Smoke	
		2.263	989.2	51.2 Left			
.5 Right	5.6	2.494	1,206.2	39.3 Left	Ten mils left	Smoke	Round in tube no. 21 right side misfired.
.3 Right	2.4		1,199.0	39.3 Left			
.3 Right	-1.3		1,160.2	27.6 Left			
.7 Right	-5.6		1,157.6	45.1 Left			
.3 Right	-18.6		1,287.4	1.4 Left			
.0	0		1,346.0	58.1 Left			
			1,394.9	10.42 Right			
			1,750.4	20.8 Left			
			1,879.3	16.9 Left			
		4.141	2,207.1	19.4 Left			
.4 Right	7.7	3.619	1,851.2	5.6 Right	On horizontally	Smoke	
.1 Right	2.5		1,862.1	8.2 Left	20 mils		
.7 Right	-7.6		1,854.6	37.2 Left	High vertical		
.9 Right	-3.2		1,861.4	40.6 Left			
.7 Right	-0.8		1,872.3	45.7 Left			
.4 Right	-1.4		2,050.4	29.2 Left			
			2,049.5	33.5 Left			
			2,132.0	10.9 Left			
			2,130.7	27.8 Left			
			2,297.5	49.8 Left			
		5.217	2,310.5	78.2 Left			
			700.0	41.5 Left	On target	Smoke	Round in tube no. 21 on right side misfired.
			684.1	43.8 Left			
			634.4	42.4 Left			
			643.3	52.8 Left			No camera coverage.
			589.8	26.5 Left			
			601.5	36.0 Left			
			506.8	39.4 Left			
			521.6	42.9 Left			
			464.9	67.0 Left			
			474.1	75.5 Left			
			513.5	29.7 Left			
.8 Right	0.0	2.203	1,360.0	6.0 Right	On target	Smoke	
		2.759	1,025.0	4.0 Right			
.0	0.0	1.625	835.0	5.0 Left	On target	Smoke	
		1.912	638.0	6.0 Left			
			1,151.0	14.0 Left	Twelve mile left	Smoke	No data
			1,140.0	27.0 Left			
.1 Right	36.0	2.234	1,102.0	22.0 Left	Ten mile left	Smoke	
		2.745	1,413.0	17.0 Left			
.6 Right	-19.0	2.338	1,125.0	34.0 Left	On target	Smoke	
		2.362	1,068.0	21.0 Left			
.8 Right	9.0	2.320	1,243.0	10.0 Right	On target	Smoke	
		2.769	1,112.0	1.0 Left			
.0	0.0	1.906	1,056.0	8.0 Right	On target	Smoke	Underneath camera did not run (No yaw data).
		2.318	831.0	19.0 Left			

Flight number	Firing date - 1962	Firing time, hours	Input to fire control unit: Range meters	Air speed knots	Altitude, meters	Number of pairs fired	Mode selection	Tubes fired	Aircraft position data •: Distance to target when firing, meters	Lateral distance from ℄ when firing/ meters	Altitude from zero firing/ meters	Actual air speed, knots	Left pod elevation from ADL, mils	Right elevat from A mi
51	2 August	1019	600	90	50	1	Split	7	700.	1.20 Left	-72.7	94.6	77.4 Up	63.4
52	2 August	1024	600	90	50	1	Split	8						
53	2 August	1033	600	90	50	1	Split	9	722.	3.50 Left	-98.2	95.8	0.4 Up	0.0
54	2 August	1038	600	90	50	1	Split	10	702.	3.05 Left	-81.1.	90.9	72.5 Up	60.7
55	2 August	1042	600	90	50	1	Split	11	704.	2.37 Left	-98.2	100.6	37.1 Up	31.5
56	2 August	1048	600	90	50	1	Split	12	681.	3.60 Left	81.0	97.1	14.2 Up	6.2
57	2 August	1129	600	90	50	1	Split	7					15.0 Up	4.3
58	2 August	1133	600	90	50	1	Split	8						
)	2 August	1139	600	90	50	1	Split	9						
60	2 August	1143	600	90	50	1	Split	10						
61	2 August	1151	600	90.	50	1	Split	11						
62	2 August	1156	600	90	50	1	Split	12						
63	2 August	1200	600	90	50	1	Split	13						
64	3 August	0651	1,800	30	50	2	Split	13,14						
65	3 August	0704	1,800	30	50	6	Split	15-20						
66	3 August	0730	1,200	30	50	6	Split	13-18						
67	3 August	0755	600	60	50	6	Split	13-18						
68	3 August	0822	1,200	60	100	6	Split	18-24						
69	3 August	0838	1,200	90	100	6	Split	18-24						
70 (1)	3 August	0900	1,200	90	100	6	Split	18-24	1,255.	5.19 Left	115.8	87.4	55.8 Up	47.2
(2)									1,246.	5.39 Left	115.8	89.7	55.6 Up	39.5
(3)									1,241.	5.68 Left	116.2	89.2	57.7 Up	46.3
(4)									1,234.	5.95 Left	116.7	89.9	56.7 Up	46.5
(5)									1,227.	6.14 Left	117.1	88.6	73.7 Up	61.0
(6)									1,221.	6.33 Left	117.6	90.1	82.2 Up	69.8
(7)														
(8)														
(9)														
(10)														
(11)														
71 (1)	3 August	1003	1,200	30	10	6	Split	18-24	1,250.	0.02 Right	19.3	40.8	32.5 Up	25.0
(2)									1,246.	0.02 Right	19.4	42.2	27.3 Up	17.4
(3)									1,244.	0.03 Right	19.4	40.3	25.5 Up	16.4
(4)									1,241.	0.04 Right	19.5	39.0	21.2 Up	7.2
(5)									1,238.	0.11 Right	19.5	39.4	18.7 Up	8.1
(6)									1,235.	0.15 Right	19.5	39.2	22.7 Up	9.7
(7)														
(8)														
(9)														
(10)														
(11)														
72 (1)	3 August	1019	1,800	30	10	6	Split	18-24	1,843.	1.03 Left	18.8	38.9	30.5 Up	23.4
(2)									1,840.	1.07 Left	18.6	38.5	26.3 Up	13.1
(3)									1,837	1.12 Left	18.7	38.1	27.3 Up	18.7
(4)									1,835.	1.13 Left	18.6	39.0	23.7 Up	14.7
(5)									1,831.	1.14 Left	18.6	36.7	32.7 Up	23.4
(6)									1,829.	1.15 Left	18.6	37.9	37.9 Up	23.4

• Time of flight is measured from first ignition to impacts of first and last round.

Table III. (Continued)

osition data •						Aircraft attitude (ADL) data			Aircraft attitude ( ) data				
Altitude from zero firing/ meters	Actual air speed, knots	Left pod elevation from ADL, mils	Right pod elevation from ADL, mils	Left sight with respect to ADL of ship/ degree	Right sight with respect to ADL of ship degree	Pitch in degrees	Pitch velocity, deg/sec	Pitch acceleration degrees/ sec/sec	Yaw, degrees	Yaw velocity, degree/sec	Yaw acceleration degrees/ sec/sec	Rocket flight time in sec•	X (fro 0)
72.7	94.6	77.4 Up	63.4 Up	1.7 Down	1.6 Down	2.9 Down	0.0	0.0	0.3 Left	5.7 Left	0.0	Not obtained	
98.2	95.8	0.4 Up	0.0	3.7 Down	4.1 Down	3.8 Down	0.0	0.0	1.9 Right	2.2 Right	32.0	2.156 2.277	
81.1	90.9	72.5 Up	60.7 Up	2.1 Down	2.2 Down	4.1 Down	0.0	0.0		0.4 Left	-35.0	2.219 2.232	
98.2	100.6	37.1 Up	31.5 Up	3.2 Down	3.2 Down	4.3 Down	0.0	0.0	0.4 Left	2.4 Left	-30.0	2.522 2.728	
81.0	97.1	14.2 Up	6.2 Up	4.0 Down	3.9 Down	2.4 Down	0.0	0.0	0.5 Right	1.1 Right	45.0	2.124 2.242	
		15.0 Up	4.3 Up	3.7 Down	3.7 Down								
15.8	87.4	55.8 Up	47.2 Up	2.2 Down	2.3 Down	1.6 Down	0.5 Down	1.7	0.6 Right	0.5 Right	0.0	3.938	
15.8	89.7	55.6 Up	39.5 Up	2.3 Down	2.4 Down	1.4 Down	0.6 Down	0.7	0.7 Right	0.5 Right	0.8		
16.2	89.2	57.7 Up	46.3 Up	2.1 Down	2.1 Down	1.5 Down	0.9 Down	4.3	0.8 Right	0.6 Right	2.5		
16.7	89.9	56.7 Up	46.5 Up	1.7 Down	1.8 Down	1.8 Down	2.0 Down	12.0	0.9 Right	1.3 Right	5.0		
17.1	88.6	73.7 Up	61.0 Up	1.3 Down	1.3 Down	2.3 Down	3.2 Down	4.6	1.2 Right	1.7 Right	1.7		
17.6	90.1	82.2 Up	69.8 Up	0.3 Down	0.4 Down	2.6 Down	3.6 Down	1.3	1.4 Right	1.8 Right	0.0		
												6.413	
19.3	40.8	32.5 Up	25.0 Up	1.7 Down	1.7 Down	0.7 Up	1.6 Up	3.3				1.662	
19.4	42.2	27.3 Up	17.4 Up	1.9 Down	2.0 Down	0.97 Up	1.3 Up	-3.3					
19.4	40.3	25.5 Up	16.4 Up	2.2 Down	2.2 Down	1.10 Up	0.6 Up	-10.0					
19.5	39.0	21.2 Up	7.2 Up	2.1 Down	2.1 Down	0.97 Up	1.0 Down	6.7					
19.5	39.4	18.7 Up	8.1 Up	2.0 Down	2.1 Down	0.90 Up	1.5 Down	1.7					
19.5	39.2	22.7 Up	9.7 Up	1.7 Down	1.7 Down	0.74 Up	1.6 Down	0.7					
16.8	38.9	30.5 Up	23.4 Up	3.0 Down	3.0 Down	1.9 Up	2.7 Down	-3.3				2.392	
18.6	38.5	26.3 Up	13.1 Up	3.1 Down	3.1 Down	1.6 Up	2.1 Down	-4.3				2.125	
18.7	38.1	27.3 Up	18.7 Up	2.9 Down	2.9 Down	1.2 Up	1.5 Down	-3.3					
18.6	39.0	23.7 Up	14.7 Up	2.7 Down	2.7 Down	1.0 Up	1.1 Down	-2.7					
18.6	36.7	32.7 Up	23.4 Up	2.4 Down	2.5 Down	1.1 Up	0.7 Down	-2.3					
18.6	37.9	37.9 Up	23.4 Up	1.8 Down	1.8 Down	1.1 Up	0.3 Down	-1.7					
												3.137	

Table III. (Continued)

ace get g. re	Aircraft position data: Lateral distance from ℄ when firing/ meters	Altitude fro a zero firing/ meters	Actual air speed, knots	Left pod elevation from ADL, mils	Right pod elevation from ADL, mils	Left sight with respect to ADL of ship/ degree	Right sight with respect to ADL of ship degree	Aircraft attitude (ADL) data: Pitch in degrees	Pitch velocity, deg/sec	Pitch acceleration degrees/ sec/sec	Aircraft attitude (℄) data: Yaw, degrees	Yaw velocity, degree/sec	ac de se
	1.20 Left	-72.7	94.6	77.4 Up	63.4 Up	1.7 Down	1.6 Down	2.9 Down	0.0	0.0	0.3 Left	5.7 Left	0
	3.50 Left	-98.2	95.8	0.4 Up	0.0	3.7 Down	4.1 Down	3.8 Down	0.0	0.0	1.9 Right	2.2 Right	32
	3.05 Left	-81.1	90.9	72.5 Up	60.7 Up	2.1 Down	2.2 Down	4.1 Down	0.0	0.0		0.4 Left	-35
	2.37 Left	-98.2	100.6	37.1 Up	31.5 Up	3.2 Down	3.2 Down	4.3 Down	0.0	0.0	0.4 Left	2.4 Left	-30
	3.60 Left	81.0	97.1	14.2 Up	6.2 Up	4.0 Down	3.9 Down	2.4 Down	0.0	0.0	0.5 Right	1.1 Right	45
				15.0 Up	4.3 Up	3.7 Down	3.7 Down						
	5.19 Left	115.8	87.4	55.2 Up	47.2 Up	2.2 Down	2.3 Down	1.6 Down	0.5 Down	1.7	0.6 Right	0.5 Right	
	5.39 Left	115.8	89.7	55.6 Up	39.5 Up	2.3 Down	2.4 Down	1.4 Down	0.6 Down	0.7	0.7 Right	0.5 Right	
	5.68 Left	116.2	89.2	57.7 Up	46.3 Up	2.1 Down	2.1 Down	1.5 Down	0.9 Down	4.3	0.8 Right	0.6 Right	
	5.95 Left	116.7	89.9	56.7 Up	46.5 Up	1.7 Down	1.8 Down	1.8 Down	2.0 Down	12.0	0.9 Right	1.3 Right	
	6.14 Left	117.1	88.6	73.7 Up	61.0 Up	1.3 Down	1.3 Down	2.3 Down	3.2 Down	4.6	1.2 Right	1.7 Right	
	6.33 Left	117.6	90.1	82.2 Up	69.8 Up	0.3 Down	0.4 Down	2.6 Down	3.6 Down	1.3	1.4 Right	1.8 Right	
	0.02 Right	19.3	40.8	32.5 Up	25.0 Up	1.7 Down	1.7 Down	0.7 Up	1.6 Up	3.3			
	0.02 Right	19.4	42.2	27.3 Up	17.4 Up	1.9 Down	2.0 Down	0.97 Up	1.3 Up	-3.3			
	0.03 Right	19.4	40.3	25.5 Up	16.4 Up	2.2 Down	2.2 Down	1.10 Up	0.6 Up	-10.0			
	0.04 Right	19.5	39.0	21.2 Up	7.2 Up	2.1 Down	2.1 Down	0.97 Up	1.0 Down	6.7			
	0.13 Right	19.5	39.4	18.7 Up	8.1 Up	2.0 Down	2.1 Down	0.90 Up	1.5 Down	1.7			
	0.15 Right	19.5	39.2	22.7 Up	9.7 Up	1.7 Down	1.7 Down	0.74 Up	1.6 Down	0.7			
	1.03 Left	18.8	38.9	30.5 Up	23.4 Up	3.0 Down	3.0 Down	1.9 Up	2.7 Down	-3.3			
	1.07 Left	18.6	38.5	26.3 Up	13.1 Up	3.1 Down	3.1 Down	1.6 Up	2.1 Down	-4.3			
	1.12 Left	18.7	38.1	27.3 Up	18.7 Up	2.9 Down	2.9 Down	1.2 Up	1.5 Down	-3.3			
	1.13 Left	18.6	39.0	23.7 Up	14.7 Up	2.7 Down	2.7 Down	1.0 Up	1.1 Down	-2.7			
	1.14 Left	18.6	36.[illegible]	32.7 Up	23.4 Up	2.4 Down	2.5 Down	1.1 Up	0.7 Down	-2.3			
	1.15 Left	18.6	37.9	37.9 Up	23.7 Up	1.8 Down	1.8 Down	1.1 Up	0.3 Down	-1.7			

Aircraft attitude (℄) data			Rocket flight time in sec	Impact data		Pilot's reported sight position	Type heads	Remarks
Yaw, degrees	Yaw velocity, degree/sec	Yaw acceleration degrees/sec/sec		X Axis (from range 0) in meters	Y Axis (from range ℄) in meters			
0.3 Left	5.7 Left	0.0	Not obtained	1,269.0	12.0 Right	Five mils left	Smoke	
				1,111.0	22.0 Left			
				1,076.0	10.0 Left	On target	Smoke	No data
				1,027.0	26.0 Right			
			2.156	1,061.0	17.0 Right	On target	Smoke	
1.9 Right	2.2 Right	32.0	2.277	953.0	11.0 Left			
			2.219	1,045.0	0.0	Ten mils left	Smoke	Underneath camera did not run
	0.4 Left	-35.0	2.232	928.0	36.0 Left			(No yaw data)
			2.522	1,260.0	34.0 Left	Ten mils left & 5 to 10 mils high	Smoke	
0.4 Left	2.4 Left	-30.0	2.728	1,150.0	16.0 Left			
			2.124	1,107.0	24.0 Right	On target	Smoke	
0.5 Right	1.1 Right	45.0	2.242	1,036.0	14.0 Left	Five mils right	Smoke	No impacts
						On target	Smoke	No impacts
						Ten mils left & five mils high	Smoke	No impacts
						20 mils low	Smoke	No impacts
						Ten mils right	Smoke	No impacts
						On target	Smoke	No impacts
						Ten mils right	Smoke	No impacts
						No report	Smoke	No impact - Scheduled six pair ripple
						On target	Smoke	No impacts
						On target	Smoke	No impacts
						Five mils left	Smoke	No impacts
						Five mils right	Smoke	No impacts
						Five mils high	Smoke	No impacts
0.6 Right	0.5 Right	0.0	3.938	1,751.0	33.0 Left	Ten mils right	Smoke	
0.7 Right	0.5 Right	0.8		1,827.0	33.0 Left			
0.8 Right	0.6 Right	2.5		1,855.0	50.0 Left			
0.9 Right	1.3 Right	5.0		1,938.0	46.0 Left			
1.2 Right	1.7 Right	1.7		1,921.0	24.0 Left			
1.4 Right	1.8 Right	0.0		1,907.0	7.0 Left			
				1,929.0	8.0 Right			
				1,977.0	9.0 Right			
				1,997.0	18.0 Right			
				2,020.0	31.0 Left			
			6.413	2,045.0	13.0 Left			
			1.662	638.0	6.0 Right	Five mils left	Smoke	No yaw data on flights 71 through 76 because of the low altitude of the aircraft at launch
				638.0	11.0 Left			
				656.0	27.0 Left			
				672.0	20.0 Left			
				708.0	17.0 Left			
				718.0	29.0 Left			
				738.0	29.0 Left			
				739.0	34.0 Left			
				1,158.0	27.0 Left			
				1,090.0	24.0 Left			
				1,094.0	7.0 Left			
			2.392	1,157.0	8.0 Left	On target	Smoke	Pilot pulled ship to right while firing.
			2.125	983.0	19.0 Left			
				942.0	2.0 Right			
				981.0	15.0 Right			
				1,009.0	30.0 Right			
				1,066.0	12.0 Right			
				1,085.0	52.0 Right			
				1,106.0	40.0 Right			
			3.137	1,134.0	61.0 Right			

Flight numbers	Firing date - 1962	Firing time, hours	Input to fire control unit: Range, meters	Air speed knots	Altitude, meters	Number of pairs fired	Mode selection	Tubes fired	Aircraft position data *: Distance to target when firing, meters	Lateral distance from ℄ when firing/ meters	Altitude from zero firing meters	Actual air speed, knots	Left pod elevation from ADL, mils	Right pod elevation from ADL, mils	Left sight with respect to ADL of ship/ degree
73 (1)	3 August	1037	1,800	60	10	6	Split	18-24	1,852.	1.41 Left	18.1	62.7	41.9 Up	33.4 Up	2.2 Down
(2)									1,847.	1.43 Left	18.2	62.5	40.2 Up	28.4 Up	2.1 Down
(3)									1,842.	1.47 Left	18.3	61.6	42.5 Up	31.2 Up	1.8 Down
(4)									1,838.	1.50 Left	18.3	63.9	43.8 Up	32.9 Up	1.6 Down
(5)									1,833.	1.54 Left	18.3	61.0	57.1 Up	49.2 Up	1.2 Down
(6)									1,829	1.56 Left	18.3	61.6	62.3 Up	46.6 Up	0.9 Down
(7)															
(8)															
(9)															
(10)															
74 (1)	6 August	0726	600	90	10	6	Split	18-23	657.	0.33 Left	32.7	90.7	95.7 Up	90.4 Up	0.4 Down
(2)									651.	0.20 Left	32.8	90.7	93.3 Up	86.2 Up	0.2 Down
(3)									645.	0.44 Left	32.7	89.4	93.2 Up	86.5 Up	0.1 Down
(4)									638.	0.44 Left	32.6	89.7	95.2 Up	87.6 Up	0.3 Up
(5)									631.	0.44 Left	32.8	89.4	109.4 Up	95.4 Up	0.8 Up
(6)									Indeter-minate						
(7)															
(8)															
(9)															
75 (1)	6 August	0827	1,800	Hover	4	24	Split	1-24	1,842.	6.6 Right	9.8	Hover	27.8 Up	30.9 Up	2.7 Down
(2)									1,842.	6.6 Right	9.9	Hover	28.6 Up	29.6 Up	2.7 Down
(3)									1,842.	6.4 Right	9.9	Hover	31.2 Up	31.3 Up	2.9 Down
(4)									1,842.	6.4 Right	9.8	Hover	27.5 Up	27.7 Up	3.0 Down
(5)									1,842.	6.5 Right	9.8	Hover	25.2 Up	26.5 Up	2.9 Down
(6)									1,842.	6.5 Right	9.9	Hover	26.6 Up	28.1 Up	3.0 Down
(7)									1,842.	6.5 Right	9.7	Hover	28.5 Up	27.6 Up	3.1 Down
(8)									1,843.	6.6 Right	10.0	Hover	25.6 Up	25.3 Up	3.1 Down
(9)									1,843.	6.5 Right	10.0	Hover	27.4 Up	24.1 Up	3.1 Down
(10)									1,843.	6.3 Right	10.0	Hover	27.4 Up	24.5 Up	2.9 Down
(11)									1,843.	6.5 Right	9.9	Hover	31.3 Up	30.5 Up	2.7 Down
(12)									1,843.	5.9 Ri	10.0	Hover	34.1 Up	34.7 Up	2.0 Down
(13)									1,843.	5.9 Right	9.9	Hover	43.0 Up	44.4 Up	1.5 Down
(14)									1,843.	6.3 Right	9.9	Hover	56.2 Up	57.6 Up	1.2 Down
(15)									1,844.	5.8 Right	9.9	Hover	65.8 Up	58.7 Up	1.0 Down
(16)										5.8 Right	10.0	Hover	65.0 Up	58.2 Up	0.9 Down
(17)													62.2 Up	60.0 Up	1.0 Down
(18)													67.2 Up	57.3 Up	1.1 Down
(19)													64.0 Up	59.5 Up	1.0 Down
(20)									No film coverage on pairs 17 through 24.				67.5 Up	67.1 Up	0.9 Down
(21)													69.8 Up	65.3 Up	0.5 Down
(22)													79.6 Up	73.0 Up	0.1 Down
(23)													82.1 Up	80.5 Up	0.5 Up
(24)													82.2 Up	87.0 Up	1.1 Up
76 (1)	6 August	0846	1,800	30	10	2	Split	18,19	571.	1.11 Left	24.8	33.0	9.4 Down	2.5 Down	3.1 Down
(2)									568.	1.13 Left	24.8	32.3	11.4 Down	9.1 Down	2.9 Down
77 (1)	6 August	0930	1,800	60	100	10	Split	1-10	1,946.	0.7 Left	114.7	62.2	29.1 Up	27.6 Up	2.7 Down
(2)									1,941.	0.9 Left	114.6	56.1	35.4 Up	35.4 Up	2.5 Down
(3)									1,937.	0.9 Left	114.7	58.5	37.8 Up	40.1 Up	2.4 Down
(4)									1,933.	0.9 Left	114.5	58.9	39.8 Up	41.4 Up	2.3 Down
(5)									1,928.	0.8 Left	114.5	59.1	46.3 Up	50.0 Up	2.0 Down
(6)									1,924.	0.9 Left	114.6	55.9	53.3 Up	54.9 Up	1.7 Down
(7)									1,920.	0.9 Left	114.4	59.8	67.6 Up	65.9 Up	1.3 Down
(8)									1,915.	0.8 Left	114.6	57.1	79.2 Up	76.3 Up	0.9 Down
(9)									1,911.	0.2 Left	114.3	59.1	86.3 Up	87.0 Up	0.6 Down
(10)									1,907.	0.8 Left	114.1	58.3	96.7 Up	93.0 Up	0.1 Down

* Time of flight is measured from first ignition to impacts of first and last round.

ft pod ration ADL, iles	Right pod elevation from ADL, miles	Left sight with respect to ADL of ship/ degree	Right sight with respect to ADL of ship/ degree	Aircraft attitude (ADL) data			Aircraft attitude (ℓ) data			Rocket flight time in sec.	Impact data		
				Pitch in degrees	Pitch velocity, deg/sec	Pitch acceleration degrees/ sec/sec	Yaw degrees	Yaw velocity, degree/sec	Yaw acceleration degrees/ sec/sec		X Axis (from range 0) in meters	Y Axis (from range ℓ) in meters	
) Up	33.4 Up	2.2 Down	2.2 Down	0.0	0.0	0.0				1.836	1,185.0	69.0 Left	
2 Up	28.4 Up	2.1 Down	2.1 Down	0.0	0.0	0.0					1,187.0	42.0 Left	
5 Up	31.2 Up	1.8 Down	1.9 Down	0.0	0.0	0.0					1,073.0	59.0 Left	
3 Up	32.9 Up	1.6 Down	1.6 Down	0.1 Down	1.3 Down	6.7					1,040.0	71.0 Left	
1 Up	49.2 Up	1.2 Down	1.2 Down	0.3 Down	1.0 Down	0.7					984.0	23.0 Left	
3 Up	46.6 Up	0.9 Down	0.7 Down	0.6 Down	1.0 Down	0.0					1,058.0	12.0 Left	
											696.0	55.0 Left	
											738.0	32.0 Left	
											757.0	82.0 Left	
										2.829	1,680.0	46.0 Left	
7 Up	90.4 Up	0.4 Down	0.4 Down	2.2 Down	0.63 Up	4.0				2.152	1,152.0	11.0 Left	
3 Up	86.2 Up	0.2 Down	0.3 Down	2.2 Down	0.10 Down	10.0					1,074.0	7.0 Right	
2 Up	86.5 Up	0.1 Down	0.2 Down	2.6 Down	1.72 Down	13.2					1,067.0	4.0 Left	
7 Up	87.6 Up	0.3 Up	0.2 Up	2.8 Down	3.73 Down	10.0					1,034.0	9.0 Right	
4 Up	95.4 Up	0.8 Up	0.8 Up	2.3 Down	4.78 Down	7.8					1,014.0	8.0 Left	
											1,034.0	30.0 Left	
											853.0	3.0 Left	
											826.0	14.0 Left	
										2.358	711.0	12.0 Left	
8 Up	30.9 Up	2.7 Down	3.0 Down	1.58 Up	0.25 Up	5.0	No yaw data on this flight due to low altitude of aircraft at firing time.			2.433	1,840.0	52.0 Left	
6 Up	29.6 Up	2.7 Down	2.9 Down	1.70 Up	0.90 Up	2.6					1,812.0	0.0	
2 Up	31.3 Up	2.9 Down	3.1 Down	1.82 Up	1.00 Up	-1.5					1,773.0	61.0 Right	
5 Up	27.7 Up	3.0 Down	3.1 Down	1.97 Up	0.53 Up	-4.7					1,758.0	36.0 Left	
2 Up	26.5 Up	2.9 Down	3.1 Down	1.98 Up	0.11 Up	2.7					1,729.0	50.0 Left	
6 Up	28.1 Up	3.0 Down	3.1 Down	2.05 Up	1.03 Up	6.5					1,654.0	96.0 Left	
5 Up	27.6 Up	3.1 Down	3.3 Down	2.20 Up	0.50 Up	-10.0					1,572.0	18.0 Right	
6 Up	25.3 Up	3.1 Down	3.3 Down	2.15 Up	0.90 Down	9.6					1,586.0	46.0 Right	
4 Up	24.1 Up	3.1 Down	3.3 Down	1.95 Up	2.25 Down	10.0					1,603.0	67.0 Right	
4 Up	24.5 Up	2.9 Down	3.1 Down	1.50 Up	3.68 Down	0.0				6.930	1,508.0	48.0 Right	
3 Up	30.5 Up	2.7 Down	2.7 Down	0.98 Up	3.40 Down	-3.1							
1 Up	34.7 Up	2.0 Down	2.2 Down	0.55 Up	2.85 Down	-4.5							
0 Up	44.4 Up	1.5 Down	1.7 Down	0.18 Up	2.13 Down	-5.7							
2 Up	57.6 Up	1.2 Down	1.3 Down	0.07 Down	1.32 Down	-6.4							
8 Up	58.7 Up	1.0 Down	1.1 Down	0.20 Down	0.33 Down	-6.8							
0 Up	58.2 Up	0.9 Down	1.0 Down	0.18 Down	0.55 Up	5.0							
2 Up	60.0 Up	1.0 Down	1.1 Down	0.08 Down	0.67 Up	-2.2							
2 Up	57.3 Up	1.1 Down	1.2 Down	0.02 Down	0.05 Down	0.0							
0 Up	59.5 Up	1.0 Down	1.1 Down	0.03 Down	0.70 Down	6.9							
5 Up	67.1 Up	0.9 Down	0.9 Down	0.24 Down	1.80 Down	6.7							
8 Up	65.3 Up	0.5 Down	0.5 Down	0.58 Down	2.43 Down	3.0							
6 Up	73.0 Up	0.1 Down	0.1 Down	1.02 Down	2.70 Down	-0.8							
1 Up	80.5 Up	0.5 Up	0.4 Up	1.53 Down	2.35 Down	-4.6							
2 Up	87.0 Up	1.1 Up	0.9 Up	1.61 Down	1.50 Down	-7.7							
4 Down	2.5 Down	3.1 Down	3.3 Down	0.1 Down	1.25 Down	5.2	No yaw data on this flight due to low altitude of aircraft when firing.			1.315	513.0	10.0 Left	
4 Down	9.1 Down	2.9 Down	3.1 Down	0.2 Down	1.92 Down	4.2				1.398	415.0	8.0 Left	
1 Up	27.6 Up	2.7 Down	2.9 Down	1.12 Down	0.45 Down	0.6	0.17 Left	1.20 Left	-1.0	3.759	394.0	10.0 Left	
4 Up	35.4 Up	2.5 Down	2.9 Down	1.20 Down	0.58 Down	1.2	0.32 Left	1.10 Left	-1.4		383.0	14.0 Left	
8 Up	40.1 Up	2.4 Down	2.6 Down	1.30 Down	0.85 Down	2.4	0.47 Left	0.62 Left	-2.2		1,860.0	31.0 Left	
8 Up	41.4 Up	2.3 Down	2.5 Down	1.45 Down	1.30 Down	3.9	0.57 Left	0.52 Left	-2.5		1,816.0	43.0 Left	
3 Up	50.0 Up	2.0 Down	2.3 Down	1.70 Down	1.95 Down	5.0	0.62 Left	0.03 Left	-3.5		1,787.0	49.0 Left	
3 Up	54.9 Up	1.7 Down	1.9 Down	2.04 Down	2.55 Down	0.0	0.51 Left	0.48 Right	3.4		1,780.0	9.0 Right	
6 Up	65.9 Up	1.3 Down	1.5 Down	2.37 Down	2.15 Down	-3.5	0.49 Left	0.93 Left	3.0		1,887.0	73.0 Left	
2 Up	76.3 Up	0.9 Down	1.0 Down	2.67 Down	1.78 Down	0.0	0.32 Left	1.32 Right	2.2		2,009.0	39.0 Left	
3 Up	87.0 Up	0.6 Down	0.7 Down	2.97 Down	2.48 Down	5.8	0.12 Left	1.55 Right	1.2		2,034.0	59.0 Left	
7 Up	93.0 Up	0.1 Down	0.3 Down	3.37 Down	3.18 Down	4.0	0.11 Right	1.72 Right	0.8	5.630	2,102.0	61.0 Left	
											2,141.0	3.0 Right	
											2,162.0	48.0 Left	
											2,169.0	25.0 Left	

Table III. (Continued)

...ata
Y Axis (from range ℄) in meters
69.0 Left
42.0 Left
59.0 Left
71.0 Left
23.0 Left
12.0 Left
55.0 Left
32.0 Left
82.0 Left
46.0 Left
11.0 Left
7.0 Right
4.0 Left
9.0 Right
8.0 Left
30.0 Left
3.0 Left
14.0 Left
12.0 Left
52.0 Left
0.0
61.0 Right
36.0 Left
50.0 Left
96.0 Left
18.0 Right
46.0 Right
67.0 Right
48.0 Right
10.0 Left
8.0 Left
10.0 Left
14.0 Left
31.0 Left
43.0 Left
49.0 Left
9.0 Right
73.0 Left
39.0 Left
59.0 Left
61.0 Left
3.0 Right
48.0 Left
25.0 Left

...ata •						Aircraft attitude (ADL) data			Aircraft attitude (℄) data				
...itude from zero ...ring meters	Actual air speed, knots	Left pod elevation from ADL, mils	Right pod elevation from ADL, mils	Left sight with respect to ADL of ship/degree	Right sight with respect to ADL of ship/degree	Pitch in degrees	Pitch velocity, deg/sec	Pitch accelera-tion degrees/sec/sec	Yaw degrees	Yaw velocity, degree/sec	Yaw accelera-tion degrees/sec/sec	Rocket flight time in sec*	X (fr... ℄) i...
..1	62.7	41.9 Up	33.4 Up	2.2 Down	2.2 Down	0.0	0.0	0.0				1.836	1,
..2	62.5	40.2 Up	28.4 Up	2.1 Down	2.1 Down	0.0	0.0	0.0					1,
..3	61.6	42.5 Up	31.2 Up	1.8 Down	1.9 Down	0.0	0.0	0.0					1,
..3	63.9	43.8 Up	32.9 Up	1.6 Down	1.6 Down	0.1 Down	1.3 Down	6.7					1,
..3	61.0	57.1 Up	49.2 Up	1.2 Down	1.2 Down	0.3 Down	1.0 Down	0.7					
..3	61.6	62.3 Up	46.6 Up	0.9 Down	0.7 Down	0.6 Down	1.0 Down	0.0					1,
												2.829	1,
												2.152	1,
..2.7	90.7	95.7 Up	90.4 Up	0.4 Down	0.4 Down	2.2 Down	0.63 Up	4.0					1,
..2.8	90.7	93.3 Up	86.2 Up	0.2 Down	0.3 Down	2.2 Down	0.10 Down	10.0					1,
..2.7	89.4	93.2 Up	86.5 Up	0.1 Down	0.2 Down	2.6 Down	1.72 Down	13.2					1,
..2.6	89.7	95.2 Up	87.6 Up	0.3 Up	0.2 Up	2.8 Down	3.73 Down	10.0					1,
..2.8	89.4	109.4 Up	95.4 Up	0.8 Up	0.8 Up	2.3 Down	4.78 Down	7.8					1,
												2.352	
9.8	Hover	27.8 Up	30.9 Up	2.7 Down	3.0 Down	1.58 Up	0.25 Up	5.0	No yaw data on this flight due to low altitude of aircraft at firing time.			2.433	1,
9.9	Hover	28.6 Up	29.6 Up	2.7 Down	2.9 Down	1.70 Up	0.90 Up	2.6					1,
9.9	Hover	31.2 Up	31.3 Up	2.9 Down	3.1 Down	1.82 Up	1.00 Up	-1.5					1,
9.8	Hover	27.5 Up	27.7 Up	3.0 Down	3.1 Down	1.97 Up	0.53 Up	-4.7					1,
9.8	Hover	25.2 Up	26.5 Up	2.9 Down	3.1 Down	1.98 Up	0.11 Up	2.7					1,
9.9	Hover	26.6 Up	28.1 Up	3.0 Down	3.1 Down	2.05 Up	1.03 Up	6.5					1,
9.7	Hover	28.5 Up	27.6 Up	3.1 Down	3.3 Down	2.20 Up	0.50 Up	-10.0					1,
10.0	Hover	25.6 Up	25.3 Up	3.1 Down	3.3 Down	2.15 Up	0.90 Down	9.6					1,
10.0	Hover	27.4 Up	24.1 Up	3.1 Down	3.3 Down	1.95 Up	2.25 Down	10.0					1,
10.0	Hover	27.4 Up	24.5 Up	2.9 Down	3.1 Down	1.50 Up	3.68 Down	0.0				6.930	1,
9.9	Hover	31.3 Up	30.5 Up	2.7 Down	2.7 Down	0.98 Up	3.40 Down	-3.1					
10.0	Hover	34.1 Up	34.7 Up	2.0 Down	2.2 Down	0.55 Up	2.85 Down	-4.5					
9.9	Hover	43.0 Up	44.4 Up	1.5 Down	1.7 Down	0.18 Up	2.13 Down	-5.7					
9.9	Hover	56.2 Up	57.6 Up	1.2 Down	1.3 Down	0.07 Down	1.32 Down	-6.4					
9.9	Hover	65.8 Up	58.7 Up	1.0 Down	1.1 Down	0.20 Down	0.33 Down	-6.8					
10.0	Hover	65.0 Up	58.2 Up	0.9 Down	1.0 Down	0.18 Down	0.55 Up	5.0					
		62.2 Up	60.0 Up	1.0 Down	1.1 Down	0.08 Down	0.67 Up	-2.2					
		67.2 Up	57.3 Up	1.1 Down	1.2 Down	0.02 Down	0.05 Down	0.0					
		64.0 Up	59.5 Up	1.0 Down	1.1 Down	0.03 Down	0.70 Down	6.9					
		67.5 Up	67.1 Up	0.9 Down	0.9 Down	0.24 Down	1.80 Down	6.7					
...rs 17 through 24.		69.8 Up	65.3 Up	0.5 Down	0.5 Down	0.58 Down	2.43 Down	3.0					
		79.6 Up	73.0 Up	0.1 Down	0.1 Down	1.02 Down	2.70 Down	-0.8					
		82.1 Up	80.5 Up	0.5 Up	0.4 Up	1.53 Down	2.35 Down	-4.6					
		82.2 Up	87.0 Up	1.1 Up	0.9 Up	1.61 Down	1.50 Down	-7.7					
24.8	33.0	9.4 Down	2.5 Down	3.1 Down	3.3 Down	0.1 Down	1.25 Down	5.2	No yaw data on this flight due to low altitude of aircraft when firing.			1.315	
24.8	32.3	11.4 Down	9.1 Down	2.9 Down	3.1 Down	0.2 Down	1.92 Down	4.2				1.39[illegible]	
114.7	62.2	29.1 Up	27.6 Up	2.7 Down	2.9 Down	1.12 Down	0.45 Down	0.6	0.17 Left	1.20 Left	-1.0	3 [illegible]59	
114.6	56.1	35.4 Up	35.4 Up	2.5 Down	2.9 Down	1.20 Down	0.58 Down	1.2	0.32 Left	1.10 Left	-1.4		
114.7	58.5	37.8 Up	40.1 Up	2.4 Down	2.6 Down	1.30 Down	0.85 Down	2.4	0.43 Left	0.82 Left	-2.2		
114.5	58.9	39.8 Up	41.4 Up	2.3 Down	2.5 Down	1.45 Down	1.30 Down	3.9	0.57 Left	0.52 Left	-2.5		
114.5	59.1	46.3 Up	50.0 Up	2.0 Down	2.3 Down	1.70 Down	1.95 Down	5.0	0.62 Left	0.03 Left	-3.5		
114.6	55.9	53.3 Up	54.9 Up	1.7 Down	1.9 Down	2.04 Down	2.55 Down	0.0	0.51 Left	0.48 Right	3.4		
114.4	59.8	67.6 Up	65.9 Up	1.3 Down	1.5 Down	2.37 Down	2.15 Down	-3.5	0.49 Left	0.93 Left	3.0		
114.6	57.1	79.2 Up	76.3 Up	0.9 Down	1.0 Down	2.67 Down	1.78 Down	0.0	0.32 Left	1.32 Right	2.2		
114.3	59.1	86.3 Up	87.0 Up	0.6 Down	0.7 Down	2.97 Down	2.48 Down	5.8	0.12 Left	1.55 Right	1.2		
114.1	58.3	96.7 Up	93.0 Up	0.1 Down	0.3 Down	3.37 Down	3.18 Down	4.0	0.11 Right	1.72 Right	0.8	[illegible].630	

Yaw ...celera- tion ...grees/ ...c/sec	Rocket flight time in sec*	Impact data: X Axis (from range C) in meters	Impact data: Y Axis (from range C) in meters	Pilots reported sight position	Type heads	Remarks
	1.836	1,185.0	69.0 Left	Five mils right	Smoke	
		1,187.0	42.0 Left			
		1,073.9	59.0 Left			
		1,040.0	71.0 Left			
		984.0	23.0 Left			
		1,058.0	12.0 Left			
		696.0	55.0 Left			
		738.0	32.0 Left			
		757.0	82.0 Left			
	2.829	1,640.0	46.0 Left			
	2.152	1,152.0	11.0 Left	Ten mils high	Smoke	
		1,074.0	7.0 Right			
		1,067.0	4.0 Left			
		1,034.0	9.0 Right			
		1,014.0	8.0 Left			
		1,034.0	30.0 Left			
		853.0	3.0 Left			
		826.0	14.0 Left			
	2.358	711.0	12.0 Left			
...o low ...me.	2.433	1,840.0	52.0 Left	On target	H. E.	
		1,812.0	0.0			
		1,773.0	61.0 Right			
		1,758.0	36.0 Left			
		1,729.0	50.0 Left			
		1,654.0	96.0 Left			
		1,572.0	18.0 Right			
		1,586.0	46.0 Right			
		1,603.0	67.0 Right			
	6.930	1,508.0	48.0 Right			
		513.0	10.0 Left	On target	Smoke	Scheduled 6 pair ripple pilot released the trigger after firing 2 pair.
to low	1.315	415.0	8.0 Left			
...g.		394.0	10.0 Left			
	1.395	383.0	14.0 Left			
-1.0	3.759	1,860.0	31.0 Left	On target	Smoke	Scheduled 24 pair ripple. After 10 pair the upper limit switch interrupted the firing voltage.
-1.4		1,815.0	43.0 Left			
-2.2		1,787.0	49.0 Left			
-2.5		1,780.0	9.0 Right			
		1,887.0	73.0 Left			
-3.5		2,009.0	39.0 Left			
3.4		2,034.0	59.0 Left			
3.0		2,102.0	61.0 Left			
2.2		2,141.0	3.0 Right			
1.2		2,162.0	48.0 Left			
0.8	.630	2,169.0	25.0 Left			

Firing numbers	Firing date - 1962	Firing time, hours	Input to fire control unit						Aircraft position data *				Left pod elevation from ADL mils	Right pod elevation from ADL mils
			Range, meters	Air speed knots	Altitude, meters	Number of pairs fired	Mode selection	Tubes fired	Distance to target when firing, meters	Lateral distance from c when firing/ meters	Altitude from zero firing/ meters	Actual air speed, knots		
78 (1)	6 August	1004	1,200	60	100	24	Split	1-24	1,321.	5.5 Right	104.7	66.0	1.7 Down	4.1 Down
(2)									1,316.	5.3 Right	104.4	63.7	1.6 Down	5.1 Down
(3)									1,312.	5.3 Right	104.3	64.7	3.9 Down	9.1 Down
(4)									1,307.	5.0 Right	104.2	63.5	4.9 Down	7.5 Down
(5)									1,295.	4.8 Right	103.9	61.0	0.4 Down	1.2 Down
(6)									1,290.	4.6 Right	103.7	60.0	3.6 Up	2.0 Up
(7)									1,285.	5.5 Right	103.8	64.1	5.3 Up	5.4 Up
(8)									1,281.	4.9 Right	103.8	61.2	9.9 Up	7.6 Up
(9)									1,276.	4.8 Right	103.7	61.4	11.3 Up	3.8 Up
(10)									1,271.	4.8 Right	103.9	60.8	4.0 Up	2.2 Down
(11)	6 August	1004	1,200	60	100	24	Split	1-24	1,267.	4.5 Right	103.2	60.6	2.6 Down	5.8 Down
(12)									1,262.	4.4 Right	103.1	61.4	4.8 Down	9.9 Down
(13)									1,248.	4.1 Right	103.3	59.8	5.0 Up	0.0
(14)									1,243.	4.4 Right	103.3	58.1	24.0 Up	22.0 Up
(15)									1,238.	4.3 Right	103.5	58.3	27.8 Up	28.1 Up
(16)									1,234.	4.3 Right	103.6	58.5	41.6 Up	49.3 Up
(17)									1,230.	4.5 Right	103.6	57.5	61.1 Up	56.5 Up
(18)									1,225.	4.4 Right	103.6	58.3	82.1 Up	82.5 Up
(19)													92.4 Up	87.6 Up
(20)													84.8 Up	80.8 Up
(21)													69.7 Up	63.4 Up
(22)													65.0 Up	61.2 Up
(23)													68.0 Up	62.7 Up
(24)													81.7 Up	74.6 Up
79 (1)	6 August	1048	1,200	90	100	24	Pilot	1-24					109.5 Up	107.2 Up
(2)													105.3 Up	103.8 Up
(3)									1,344.	3.0 Right	104.8	98.9	107.3 Up	103.5 Up
(4)									1,336.	3.1 Right	104.3	104.5	108.4 Up	104.5 Up
(5)									1,328.	3.1 Right	104.1	98.1	103.4 Up	102.0 Up
(6)									1,321.	3.3 Right	103.7	99.3	107.8 Up	103.1 Up
(7)									1,315.	3.1 Right	103.0	98.3	105.6 Up	95.6 Up
(8)									1,306.	3.2 Right	103.2	99.8	104.1 Up	99.2 Up
(9)									1,299.	3.5 Right	103.2	96.9	104.6 Up	101.3 Up
(10)									1,291.	3.4 Right	102.7	100.2	108.7 Up	102.3 Up
(11)									1,284.	3.5 Right	102.3	99.7	104.3 Up	99.7 Up
(12)									1,275.	3.5 Right	102.7	102.9	107.4 Up	96.6 Up
(13)									1,269.	3.5 Right	101.5	98.7	108.7 Up	98.7 Up
(14)									1,262.	3.5 Right	101.3	100.4	103.4 Up	97.6 Up
(15)									1,254.	3.2 Right	101.5	97.3	106.6 Up	102.7 Up
(16)									1,247.	3.5 Right	101.1	96.2	107.2 Up	99.8 Up
(17)									1,240.	3.7 Right	101.5	98.9	104.9 Up	103.3 Up
(18)									1,233.	4.0 Right	101.4	97.1	105.3 Up	104.6 Up
(19)									1,226.	4.0 Right	101.2	96.0	102.2 Up	100.3 Up
(20)									1,218.	4.1 Right	101.0	95.2	118.2 Up	108.1 Up
(21)									1,211.	3.9 Right	100.0	96.0	122.3 Up	103.9 Up
(22)									1,204.	4.2 Right	100.8	94.0	128.0 Up	110.7 Up
(23)									1,197.	4.5 Right	100.9	95.2	121.0 Up	108.2 Up
(24)									1,190.	4.2 Right	100.6	91.3	126.4 Up	111.2 Up

* Time of flight is measured from first ignition to impacts of first and last round.

Table III. (Concluded)

Left pod elevation from ADL, mils	Right pod elevation from ADL, mils	Left sight with respect to ADL of ship/ degree	Right sight with respect to ADL of ship/ degree	Aircraft attitude (ADL) data			Aircraft attitude (ξ) data			Rocket flight time in sec	Impact data		Aircraft position da
				Pitch in degrees	Pitch velocity, deg/sec	Pitch acceleration degrees/ sec/sec	Yaw degrees	Yaw Velocity, degree/sec	Yaw acceleration degrees/ sec/sec		X Axis (from range 0) in meters	Y Axis (from range c) in meters	Lateral distance from c when firing/ meters
1.7 Down	4.1 Down	4.0 Down	4.0 Down	1.22 Down	0.02 Up	0.0	1.67 Left	0.18 Right	0.0	2.317	1,294.0	6.0 Left	5.5 Right
1.6 Down	5.1 Down	4.0 Down	4.0 Down	1.21 Down	0.10 Up	1.8	1.63 Left	0.18 Right	0.0		1,259.0	49.0 Left	5.3 Right
3.9 Down	9.1 Down	3.9 Down	3.9 Down	1.20 Down	0.25 Up	0.0	1.60 Left	0.05 Right	-3.5		1,244.0	39.0 Left	5.3 Right
4.9 Down	7.5 Down	4.3 Down	4.2 Down	1.26 Down	0.95 Up	7.5	1.65 Left	0.70 Left	3.3		1,236.0	20.0 Left	5.0 Right
0.4 Down	1.2 Down	3.4 Down	3.5 Down	1.61 Down	0.25 Down	-6.7	1.95 Left	0.60 Left	-1.5		1,212.0	8.0 Left	4.8 Right
3.6 Up	2.0 Up	3.3 Down	3.5 Down	1.54 Down	1.25 Up	1.2	2.03 Left	0.37 Left	-1.5		1,214.0	38.0 Left	4.6 Right
5.3 Up	5.4 Up	3.4 Down	3.5 Down	1.34 Down	1.05 Up	-2.2	2.05 Left	0.15 Left	-1.5		1,179.0	46.0 Left	5.5 Right
9.9 Up	7.6 Up	3.5 Down	3.6 Down	1.21 Down	1.25 Up	3.8	2.03 Left	0.02 Right	0.0		1,166.0	34.0 Left	4.9 Right
1.3 Up	3.8 Up	3.7 Down	3.9 Down	1.94 Down	1.70 Up	0.8	2.00 Left	0.22 Right	1.2		1,105.0	36.0 Left	4.8 Right
4.0 Up	2.2 Down	4.0 Down	4.0 Down	0.72 Down	1.45 Up	-3.8	1.97 Left	0.40 Right	1.2		1,098.0	22.0 Left	4.8 Right
2.6 Down	5.8 Down	4.2 Down	4.1 Down	0.59 Down	0.0	0.0	1.88 Left	0.57 Right	1.2		1,095.0	0.0	
4.8 Down	9.9 Down	4.3 Down	4.2 Down	0.74 Down	2.05 Down	9.5	1.80 Left	0.74 Right	1.1		1,048.0	16.0 Left	4.5 Right
5.0 Up	0.0	2.9 Down	3.1 Down	2.19 Down	3.20 Down	-18.1	1.38 Left	1.20 Right	0.6		1,830.0	24.0 Left	4.4 Right
24.0 Up	22.0 Up	2.4 Down	2.6 Down	2.54 Down	2.45 Down	6.9	1.17 Left	1.28 Right	0.4		1,792.0	27.0 Left	4.1 Right
27.8 Up	28.1 Up	2.0 Down	2.2 Down	2.91 Down	3.75 Down	14.6	0.95 Left	1.27 Right	-0.5		1,659.0	11.0 Left	4.4 Right
41.6 Up	49.3 Up	1.4 Down	1.6 Down	3.74 Down	5.85 Down	7.5	0.80 Left	1.11 Right	-1.5		1,676.0	117.0 Left	4.3 Right
51.1 Up	56.5 Up	0.5 Down	0.6 Down	4.59 Down	6.70 Down	5.0	0.65 Left	0.93 Right	-1.6		1,352.0	12.0 Left	4.3 Right
82.1 Up	82.5 Up	0.7 Up	0.4 Up	5.54 Down	6.98 Down	0.0	0.55 Left	0.67 Right	-1.9		1,362.0	17.0 Right	4.5 Right
92.4 Up	87.6 Up	2.0 Down	2.1 Down	2.76 Down	1.33 Up	-6.9	1.60 Left	0.70 Left	2.3		1,369.0	33.0 Left	4.4 Right
84.8 Up	80.8 Up	2.1 Down	2.2 Down	2.67 Down	0.75 Up	-13.1	1.65 Left	0.85 Left	2.3		1,391.0	3.0 Left	
69.7 Up	63.4 Up	2.0 Down	2.2 Down	2.69 Down	1.05 Down	6.3	1.77 Left	1.10 Left	2.0		1,395.0	25.0 Left	
65.0 Up	61.2 Up	1.7 Down	2.0 Down	3.24 Down	5.25 Down	18.8	1.95 Left	1.40 Left	1.8		1,419.0	7.0 Left	
68.0 Up	62.7 Up	1.1 Down	1.3 Down	3.99 Down	6.50 Down	11.9	2.17 Left	1.63 Left	1.8	5.172	1,429.0	9.0 Right	
81.7 Up	74.6 Up	0.1 Up	0.0	5.09 Down	8.50 Down	11.9	2.43 Left	1.85 Left	1.5				
09.5 Up	107.2 Up	2.5 Up	2.3 Up	6.57 Down	0.15 Down	0.5	1.83 Left	0.18 Right	-0.1	2.133	879.0	12.0 Left	
05.3 Up	103.8 Up	2.5 Up	2.3 Up	6.62 Down	0.26 Down	1.3	1.80 Left	0.17 Right	-0.1		913.0	13.0 Left	
07.3 Up	103.5 Up	2.5 Up	2.4 Up	6.67 Down	0.50 Down	2.5	1.78 Left	0.16 Right	-0.1		940.0	2.0 Right	
08.4 Up	104.5 Up	2.5 Up	2.4 Up	6.77 Down	0.90 Down	2.3	1.76 Left	0.12 Right	-0.2		928.0	26.0 Left	
03.4 Up	102.0 Up	2.4 Up	2.4 Up	6.90 Down	0.80 Down	-3.8	1.73 Left	0.07 Right	-0.4		961.0	23.0 Left	3.0 Right
07.8 Up	103.1 Up	2.4 Up	2.4 Up	6.92 Down	0.55 Up	15.0	1.73 Left	0.05 Left	1.1		985.0	0.0	3.1 Right
05.6 Up	95.6 Up	2.5 Up	2.4 Up	6.69 Down	2.32 Up	8.3	1.75 Left	0.27 Left	2.9		1,006.0	11.0 Left	3.1 Right
04.1 Up	99.2 Up	2.5 Up	2.3 Up	6.27 Down	2.57 Up	-6.3	1.83 Left	0.82 Left	3.3		1,029.0	6.0 Left	3.3 Right
04.6 Up	101.3 Up	2.5 Up	2.4 Up	5.97 Down	1.45 Up	-12.3	1.98 Left	0.82 Left	-3.5		1,049.0	35.0 Left	3.1 Right
08.7 Up	102.3 Up	2.4 Up	2.4 Up	5.92 Down	1.40 Down	23.8	2.07 Left	0.30 Left	-4.3		1,286.0	28.0 Left	3.2 Right
04.3 Up	99.7 Up	2.4 Up	2.4 Up	6.32 Down	3.40 Down	9.3	2.06 Left	0.32 Right	2.8		1,280.0	2.0 Right	3.5 Right
07.4 Up	96.6 Up	2.4 Up	2.4 Up	6.92 Down	4.45 Down	5.7	1.96 Left	0.50 Right	-2.0		1,259.0	27.0 Left	3.4 Right
108.7 Up	98.7 Up	2.5 Up	2.4 Up	7.62 Down	5.08 Down	2.5	1.93 Left	0.10 Right	-3.5		1,259.0	0.0	3.5 Right
103.4 Up	97.6 Up	2.5 Up	2.4 Up	8.37 Down	5.55 Down	2.5	1.94 Left	0.55 Left	5.1		1,255.0	18.0 Right	3.5 Right
106.6 Up	102.7 Up	2.4 Up	2.3 Up	9.22 Down	5.87 Down	2.5	2.08 Left	1.53 Left	6.5		1,244.0	10.0 Right	3.5 Right
107.2 Up	99.8 Up	2.4 Up	2.3 Up	10.07 Down	6.10 Down	1.0	2.38 Left	2.33 Left	5.8		1,235.0	19.0 Right	3.2 Right
104.9 Up	103.3 Up	2.4 Up	2.4 Up	10.99 Down	6.12 Down	-1.3	2.73 Left	2.47 Left	-2.1		1,213.0	15.0 Left	3.5 Right
105.3 Up	104.6 Up	2.4 Up	2.3 Up	11.82 Down	5.50 Down	-6.5	3.08 Left	1.92 Left	-3.9		1,199.0	1.0 Right	3.7 Right
102.2 Up	100.3 Up	2.4 Up	2.4 Up	12.54 Down	4.35 Down	-10.8	3.28 Left	1.37 Left	-3.9		1,163.0	28.0 Left	4.0 Right
118.2 Up	108.1 Up	2.4 Up	2.4 Up	13.07 Down	2.75 Down	-11.9	3.46 Left	0.75 Left	-3.9		1,159.0	3.0 Right	4.0 Right
122.3 Up	103.9 Up	2.5 Up	2.5 Up	13.34 Down	0.95 Down	-11.9	3.51 Left	0.0	0.0		1,143.0	16.0 Right	4.1 Right
128.0 Up	110.7 Up	2.5 Up	2.4 Up	13.37 Down	0.55 Up	10.0	3.43 Left	1.25 Right	10.5		1,125.0	4.0 Right	3.9 Right
121.0 Up	108.2 Up	2.5 Up	2.6 Up	13.20 Down	1.95 Up	9.5	3.16 Left	2.35 Right	5.2		1,121.0	15.0 Left	4.2 Right
126.4 Up	111.2 Up	2.4 Up	2.3 Up	12.79 Down	3.20 Up	8.0	2.76 Left	2.78 Right	2.3		1,104.0	13.0 Left	4.5 Right
											1,088.0	1.0 Right	4.2 Right
											1,098.0	18.0 Right	
											1,055.0	15.0 Right	
										5.208	1,028.0	8.0 Right	

ct data

Table III. (Concluded)

Y Axis (from range c) in meters	Aircraft position data — Lateral distance from c when firing/ meters	Altitude from sero firing/ meters	Actual air speed, knots	Left pod elevation from ADL mils	Right pod elevation from ADL mils	Left sight with respect to ADL of ship/ degree	Right sight with respect to ADL of ship/ degree	Aircraft attitude (ADL) data — Pitch in degrees	Pitch velocity, deg/sec	Pitch acceleration degrees/ sec/sec	Aircraft attitude ( ) data — Yaw degrees	Yaw Velocity, degree/sec	Yaw acceleration degrees/ sec/sec	Rocket flight tim in sec
6.0 Left	5.5 Right	104.7	66.0	1.7 Down	4.1 Down	4.0 Down	4.0 Down	1.22 Down	0.02 Up	0.0	1.67 Left	0.16 Right	0.0	2.317
49.0 Left	5.3 Right	104.4	63.7	1.6 Down	5.1 Down	4.0 Down	4.0 Down	1.21 Down	0.10 Up	1.8	1.63 Left	0.18 Right	0.0	
39.0 Left	5.3 Right	104.3	64.7	3.9 Down	9.1 Down	3.9 Down	3.9 Down	1.20 Down	0.25 Up	0.0	1.60 Left	0.05 Right	-3.5	
20.0 Left	5.0 Right	104.2	63.5	4.9 Down	7.5 Down	4.3 Down	4.2 Down	1.26 Down	0.95 Up	7.5	1.65 Left	0.70 Left	3.3	
8.0 Left	4.8 Right	103.9	61.0	0.4 Down	1.2 Down	3.4 Down	3.5 Down	1.61 Down	0.25 Down	-6.7	1.95 Left	0.60 Left	-1.5	
38.0 Left	4.6 Right	103.7	60.0	3.6 Up	2.0 Up	3.3 Down	3.5 Down	1.54 Down	1.25 Up	1.2	2.03 Left	0.37 Left	-1.5	
46.0 Left	5.5 Right	103.8	64.1	5.3 Up	5.4 Up	3.4 Down	3.5 Down	1.34 Down	1.05 Up	-2.2	2.05 Left	0.15 Left	-1.5	
34.0 Left	4.9 Right	103.8	61.2	9.9 Up	7.6 Up	3.5 Down	3.6 Down	1.21 Down	1.25 Up	3.8	2.03 Left	0.02 Right	0.0	
36.0 Left	4.8 Right	103.7	61.4	11.3 Up	3.8 Up	3.7 Down	3.9 Down	1.94 Down	1.70 Up	0.8	2.00 Left	0.22 Right	1.2	
22.0 Left	4.8 Right	103.9	60.8	4.0 Up	2.2 Down	4.0 Down	4.0 Down	0.72 Down	1.45 Up	-3.8	1.97 Left	0.40 Right	1.2	
0.0	4.5 Right	103.2	60.6	2.6 Down	5.8 Down	4.2 Down	4.1 Down	0.59 Down	0.0	0.0	1.88 Left	0.57 Right	1.2	
16.0 Left	4.4 Right	103.1	61.4	4.8 Down	9.9 Down	4.3 Down	4.2 Down	0.74 Down	2.05 Down	9.5	1.80 Left	0.74 Right	1.1	
24.0 Left	4.1 Right	103.3	59.8	5.0 Up	0.0	2.9 Down	3.1 Down	2.19 Down	3.20 Down	-18.1	1.38 Left	1.20 Right	0.6	
27.0 Left	4.4 Right	103.3	58.1	24.0 Up	22.0 Up	2.4 Down	2.6 Down	2.54 Down	2.45 Down	6.9	1.17 Left	1.28 Right	0.4	
11.0 Left	4.3 Right	103.5	58.3	27.8 Up	28.1 Up	2.0 Down	2.2 Down	2.91 Down	3.75 Down	14.6	0.95 Left	1.27 Right	-0.5	
117.0 Left	4.3 Right	103.6	58.5	41.6 Up	49.3 Up	1.4 Down	1.6 Down	3.74 Down	5.85 Down	7.5	0.80 Left	1.11 Right	-1.5	
12.0 Left	4.5 Right	103.6	57.5	61.1 Up	56.5 Up	0.5 Down	0.6 Down	4.59 Down	6.70 Down	5.0	0.65 Left	0.93 Right	-1.6	
17.0 Right	4.4 Right	103.6	58.3	82.1 Up	82.5 Up	0.7 Up	0.4 Up	5.54 Down	6.98 Down	0.0	0.55 Left	0.67 Right	-1.9	
33.0 Left				92.4 Up	87.6 Up	2.0 Down	2.1 Down	2.76 Down	1.33 Up	-6.9	1.60 Left	0.70 Left	2.3	
3.0 Left				84.8 Up	80.8 Up	2.1 Down	2.2 Down	4.97 Down	0.75 Up	-13.1	1.65 Left	0.85 Left	2.3	
25.0 Left				69.7 Up	63.4 Up	2.0 Down	2.2 Down	2.59 Down	1.05 Down	6.3	1.77 Left	1.10 Left	2.0	
7.0 Left				65.0 Up	61.2 Up	1.7 Down	2.0 Down	3.24 Down	5.25 Down	18.8	1.95 Left	1.40 Left	1.8	
9.0 Right				68.0 Up	62.7 Up	1.1 Down	1.3 Down	3.99 Down	6.50 Down	11.9	2.17 Left	1.63 Left	1.8	5.172
12.0 Left				81.7 Up	74.6 Up	0.1 Up	0.0	5.09 Down	8.50 Down	11.9	2.43 Left	1.85 Left	1.5	
13.0 Left				109.5 Up	107.2 Up	2.5 Up	2.3 Up	6.57 Down	0.15 Down	0.5	1.83 Left	0.18 Right	-0.1	2.133
2.0 Right				105.3 Up	103.8 Up	2.5 Up	2.3 Up	6.62 Down	0.26 Down	1.3	1.80 Left	0.17 Right	-0.1	
26.0 Left	3.0 Right	104.8	98.9	107.3 Up	103.5 Up	2.5 Up	2.4 Up	6.67 Down	0.50 Down	2.5	1.78 Left	0.16 Right	-0.1	
23.0 Left	3.1 Right	104.3	104.5	108.4 Up	104.5 Up	2.5 Up	2.4 Up	6.77 Down	0.90 Down	2.3	1.76 Left	0.12 Right	-0.2	
0.0	3.1 Right	104.1	98.1	103.4 Up	102.0 Up	2.4 Up	2.4 Up	6.90 Down	0.80 Down	-3.8	1.73 Left	0.07 Right	-0.4	
11.0 Left	3.3 Right	103.7	99.3	107.8 Up	103.1 Up	2.4 Up	2.4 Up	6.92 Down	0.55 Up	15.0	1.73 Left	0.05 Left	1.1	
6.0 Left	3.1 Right	103.0	98.3	105.6 Up	95.6 Up	2.5 Up	2.4 Up	6.69 Down	2.32 Up	8.3	1.75 Left	0.27 Left	2.9	
35.0 Left	3.2 Right	103.2	99.8	104.1 Up	99.2 Up	2.5 Up	2.3 Up	6.27 Down	2.57 Up	-6.3	1.83 Left	0.82 Left	3.3	
28.0 Left	3.5 Right	103.2	96.9	104.6 Up	101.3 Up	2.5 Up	2.4 Up	5.97 Down	1.45 Up	-12.3	1.98 Left	0.82 Left	-3.5	
2.0 Right	3.4 Right	102.7	100.2	108.7 Up	102.3 Up	2.4 Up	2.4 Up	5.92 Down	1.40 Down	23.8	2.07 Left	0.30 Left	-4.3	
27.0 Left	3.5 Right	102.3	99.7	104.3 Up	99.7 Up	2.4 Up	2.4 Up	6.32 Down	3.40 Down	9.3	2.06 Left	0.32 Right	2.8	
0.0	3.5 Right	102.7	102.9	107.4 Up	96.6 Up	2.4 Up	2.4 Up	6.92 Down	4.45 Down	5.7	1.96 Left	0.59 Right	-2.0	
18.0 Right	3.5 Right	101.5	98.7	108.7 Up	98.7 Up	2.5 Up	2.4 Up	7.62 Down	5.08 Down	2.5	1.93 Left	0.10 Right	-3.5	
10.0 Right	3.5 Right	101.3	100.4	103.4 Up	97.6 Up	2.5 Up	2.4 Up	8.37 Down	5.55 Down	2.5	1.94 Left	0.55 Left	5.1	
19.0 Right	3.2 Right	101.5	97.3	106.6 Up	102.7 Up	2.4 Up	2.3 Up	9.22 Down	5.87 Down	2.5	2.08 Left	1.53 Left	6.5	
15.0 Left	3.5 Right	101.1	96.2	107.2 Up	99.8 Up	2.4 Up	2.3 Up	10.07 Down	6.10 Down	1.0	2.38 Left	2.33 Left	3.8	
1.0 Right	3.7 Right	101.5	98.9	104.9 Up	103.3 Up	2.4 Up	2.4 Up	10.99 Down	6.12 Down	-1.3	2.73 Left	2.47 Left	-2.1	
28.0 Left	4.0 Right	101.4	97.1	105.3 Up	104.6 Up	2.4 Up	2.3 Up	11.82 Down	5.50 Down	-6.5	3.08 Left	1.92 Left	-3.9	
3.0 Right	4.0 Right	101.2	96.0	102.2 Up	100.3 Up	2.4 Up	2.4 Up	12.54 Down	4.35 Down	-10.8	3.28 Left	1.37 Left	-3.9	
16.0 Right	4.1 Right	101.0	95.2	118.2 Up	108.1 Up	2.4 Up	2.4 Up	13.07 Down	2.75 Down	-11.9	3.46 Left	0.75 Left	-3.9	
4.0 Right	3.9 Right	100.0	96.0	122.3 Up	103.9 Up	2.5 Up	2.5 Up	13.34 Down	0.95 Down	-11.9	3.51 Left	0.0	0.0	
15.0 Left	4.2 Right	100.8	94.0	128.0 Up	110.7 Up	2.5 Up	2.4 Up	13.37 Down	0.55 Up	10.0	3.43 Left	1.25 Right	10.5	
13.0 Left	4.5 Right	100.9	95.2	121.0 Up	108.2 Up	2.5 Up	2.6 Up	13.20 Down	1.95 Up	9.5	3.16 Left	0.35 Right	5.2	
1.0 Right	4.2 Right	100.6	91.3	126.4 Up	111.2 Up	2.4 Up	2.3 Up	12.79 Down	3.20 Up	8.0	2.76 Left	0.78 Right	2.3	
18.0 Right														
15.0 Right														
8.0 Right														

5.20

titude (¢) data			Impact data				
Yaw locity, ree/sec	Yaw accelera-tion degrees/ sec/sec	Rocket flight time in sec*	X Axis (from range 0) in meters	Y Axis (from range c) in meters	Pilots reported sight position	Type heads	Remarks
18 Right	0.0	2.317	1,294.0	6.0 Left			Scheduled 24 pair ripple. All rounds were fired but the firing was interrupted twice by the lower limit switch and once by by the upper limit switches
18 Right	0.0		1,259.0	49.0 Left			
05 Right	-3.5		1,244.0	39.0 Left			
70 Left	3.3		1,236.0	20.0 Left			
60 Left	-1.5		1,212.0	8.0 Left			
37 Left	-1.5		1,214.0	38.0 Left			
15 Left	-1.5		1,179.0	46.0 Left			
02 Right	0.0		1,166.0	34.0 Left			
22 Right	1.2		1,105.0	36.0 Left			
40 Right	1.2		1,098.0	22.0 Left			
57 Right	1.2		1,093.0	0.0			
74 Right	1.1		1,048.0	16.0 Left			
20 Right	0.6		1,830.0	24.0 Left			
28 Right	0.4		1,792.0	27.0 Left			
27 Right	-0.5		1,659.0	11.0 Left			
11 Right	-1.5		1,676.0	117.0 Left			
93 Right	-1.6		1,352.0	12.0 Left			
67 Right	-1.9		1,362.0	17.0 Right			
.70 Left	2.3		1,369.0	33.0 Left			
.85 Left	2.3		1,391.0	3.0 Left			
.10 Left	2.0		1,395.0	25.0 Left			
.40 Left	1.8		1,419.0	7.0 Left			
.63 Left	1.8	5.172	1,429.0	9.0 Right			
.85 Left	1.5						
.18 Right	-0.1	2.133	879.0	12.0 Left	On target	H.E.	Limit switches were by passed.
.17 Right	-0.1		913.0	13.0 Left			
.16 Right	-0.1		940.0	2.0 Right			
.12 Right	-0.2		928.0	26.0 Left			
.07 Right	-0.4		961.0	23.0 Left			
.05 Left	1.1		985.0	0.0			
.27 Left	2.9		1,006.0	11.0 Left			
.82 Left	3.3		1,029.0	6.0 Left			
.82 Left	-3.5		1,049.0	35.0 Left			
.30 Left	-4.3		1,286.0	28.0 Left			
.32 Right	2.8		1,286.0	2.0 Right			
.50 Right	-2.0		1,259.0	27.0 Left			
0.10 Right	-3.5		1,259.0	0.0			
0.55 Left	5.1		1,255.0	18.0 Right			
1.33 Left	6.5		1,244.0	10.0 Right			
2.33 Left	3.8		1,235.0	19.0 Right			
2.47 Left	-2.1		1,213.0	15.0 Left			
3.92 Left	-3.9		1,199.0	1.0 Right			
37 Left	-3.9		1,163.0	28.0 Left			
75 Left	-3.9		1,159.0	3.0 Right			
0.0	0.0		1,143.0	16.0 Right			
.25 Right	10.5		1,125.0	4.0 Right			
35 Right	5.2		1,121.0	15.0 Left			
78 Right	2.3		1,104.0	13.0 Left			
			1,088.0	1.0 Right			
			1,098.0	18.0 Right			
			1,055.0	15.0 Right			
		5.208	1,028.0	8.0 Right			

Table IV. LAUNCH AND A

Flight no.	Date of firing 1962	No. of pair fired	Input to fire control unit				Left pod elevation from ADL, mils	Right pod elevation from ADL, mils	Right sight elevation from ADL, mils	Head type
			Altitude, meters	Air speed, knots	Range, meters	Mode selection				
1	4 October	6	50	0	1,500	Pilot	85.1	90.9	29.4	Iner
							84.0	90.9	29.4	
							82.7	90.9	29.4	
							81.9	90.9	29.4	
							83.2	90.9	29.4	
							85.7	90.9	29.4	
2	4 October	6	50	0	1,500	Pilot	85.0	95.0	46.0	Iner
							93.0	98.0	29.0	
							93.0	98.0	29.0	
							81.0	98.0	30.0	
							87.0	93.0	30.0	
							85.0	93.0	30.0	
3	4 October	6	50	0	1,500	Pilot	52.7	55.9	-10.9	Iner
							54.9	53.8	- 8.9	
							52.4	54.9	- 9.4	
							54.2	56.2	-10.4	
							55.7	53.5	-10.9	
							49.8	56.6	-10.9	
4	4 October	6	50	0		Pilot	56.0	55.0	- 9.0	Iner
							56.0	54.0	-10.0	
							51.0	54.0	-10.0	
							50.0	56.0	- 9.0	
							52.0	53.0	- 9.0	
							48.0	57.0	- 9.0	
5	4 October	24 (1)	50	0	1,500	Pilot	80.0	76.3	10.2	Iner
		(2)					76.4	75.0	10.0	
		(3)					77.5	75.5	10.2	
		(4)					76.4	73.3	10.2	
		(5)					76.4	76.5	10.2	
		(6)					76.4	76.5	10.2	
		(7)					76.1	78.0	10.2	
		(8)					76.8	76.0	10.2	
		(9)					76.8	79.0	10.2	
		(10)					78.8	77.0	10.2	
		(11)					76.2	76.0	10.2	
		(12)					78.2	80.5	10.2	
		(13)					78.6	77.8	10.2	
		(14)					78.2	76.5	10.2	
		(15)					78.5	80.3	10.2	
		(16)					78.5	78.5	10.2	
		(17)					76.8	78.3	10.2	
		(18)					74.6	79.8	10.2	
		(19)					73.9	76.5	10.2	
		(20)					75.7	79.0	10.2	
		(21)					75.4	79.3	10.2	
		(22)					75.4	77.5	10.2	
		(23)					73.9	77.3	10.2	
		(24)					72.5	76.8	10.2	

* g loads taken from peak-to-peak. The frequencies given were computed using the recorder speed.

AUNCH AND ACCELERAMETER DATA.

Right sight elevation from ADL, mils	Head type	Max g * load and frequency at that load				Max. frequency and g load at that frequency				Temperature, degrees, F	
		Lateral plane		Longitudinal plane		Lateral plane		Longitudinal plane			
		Load g	Frequency, cps	Load g	Frequency, cps	Load g	Frequency, cps	Load g	Frequency, cps		
29.4 29.4 29.4 29.4 29.4 29.4	Inert	0.3	20.8	0.3	18.7	0.3	20.8	0.25	26.6	129.4	Fir inc
46.0 29.0 29.0 30.0 30.0 30.0	Inert	1.2	20.0	1.1	20.0	1.2	20.0	1.1	20.0	116.0	Fir upp afte Oth wh
-10.9 - 8.9 - 9.4 -10.4 -10.9 -10.9	Inert	0.5	15.8	0.8	21.2	0.5	15.8	0.8	21.2	113.8	Fir inc
- 9.0 -10.0 -10.0 - 9.0 - 9.0 - 9.0	Inert	0.4	26.3	0.6	20.8	0.4	26.3	0.6	20.8	124.0	Fir inc
10.2 10.0 10.2 10.2 10.2 10.2 10.2 10.2 10.2 10.2 10.2 10.2 10.2 10.2 10.2 10.2 10.2 10.2 10.2 10.2 10.2 10.2 10.2 10.2 10.2 10.2 10.2 10.2	Inert	0.58	19.9	0.7	22.0	0.58	19.9	0.7	22.0	120.0	Fir Nc ma sa

Table IV. LAUNCH AND ACCELERAMETER DATA.

Left pod elevation from ADL, mils	Right pod elevation from ADL, mils	Right sight elevation from ADL, mils	Head type	Max g * load and frequency at that load				Max. freque and g load at that		
				Lateral plane		Longitudinal plane		Lateral plane		Lon
				Load g	Frequency, cps	Load g	Frequency, cps	Load g	Frequency, cps	Loa g
85.1	90.9	29.4	Inert	0.3	20.8	0.3	18.7	0.3	20.8	0.2
84.0	90.9	29.4								
82.7	90.9	29.4								
81.9	90.9	29.4								
83.2	90.9	29.4								
85.[illegible]	90.9	29.4								
85.0	95.0	46.0	Inert	1.2	20.0	1.1	20.0	1.2	20.0	1.1
[illegible].0	98.0	29.0								
93.0	98.0	29.0								
91.0	98.0	30.0								
87.0	93.0	30.0								
85.0	93.0	30.0								
52.7	55.9	-10.9	Inert	0.5	15.8	0.8	21.2	0.5	15.8	0.8
54.9	53.8	- 8.9								
52.4	54.9	- 9.4								
54.2	56.2	-10.4								
55.7	53.5	-10.9								
49.8	56.6	-10.9								
56.0	55.0	- 9.0	Inert	0.4	26.3	0.6	20.8	0.4	26.3	0.6
56.0	54.0	-10.0								
51.0	54.0	-10.0								
50.0	56.0	- 9.0								
52.0	53.0	- 9.0								
48.0	57.0	- 9.0								
80.0	76.3	10.2	Inert	0.58	19.9	0.7	22.0	0.58	19.9	0.7
76.4	75.0	10.0								
77.5	75.5	10.2								
76.4	73.3	10.2								
76.4	76.5	10.2								
76.4	76.5	10.2								
76.1	76.0	10.2								
76.8	76.0	10.2								
76.8	79.0	10.2								
78.8	77.0	10.2								
76.2	76.0	10.2								
78.2	80.5	10.2								
78.6	77.8	10.2								
78.2	76.5	10.2								
78.5	80.3	10.2								
78.5	78.5	10.2								
76.8	78.3	10.2								
74.6	79.8	10.2								
73.9	76.5	10.2								
75.7	79.0	10.2								
75.4	79.3	10.2								
75.4	77.5	10.2								
73.9	77.3	10.2								
72.5	76.8	10.2								

Max. frequency and g load at that frequency				Temperature, degrees, F	Remarks
Lateral plane		Longitudinal plane			
Load g	Frequency, cps	Load g	Frequency, cps		
0.3	20.8	0.25	26.6	129.4	Fired without incident.
1.2	20.0	1.1	20.0	116.0	Firing interrupted by upper limit switch after firing one pair. Other 5 pairs fired when closer to target.
0.5	15.8	0.8	21.2	113.8	Fired six pairs without incident.
0.4	26.3	0.6	20.8	124.0	Fired six pairs without incident.
0.58	19.9	0.7	22.0	120.0	Fired 24 pairs except No. 4 tube on right side misfired. Limit switches bypassed.

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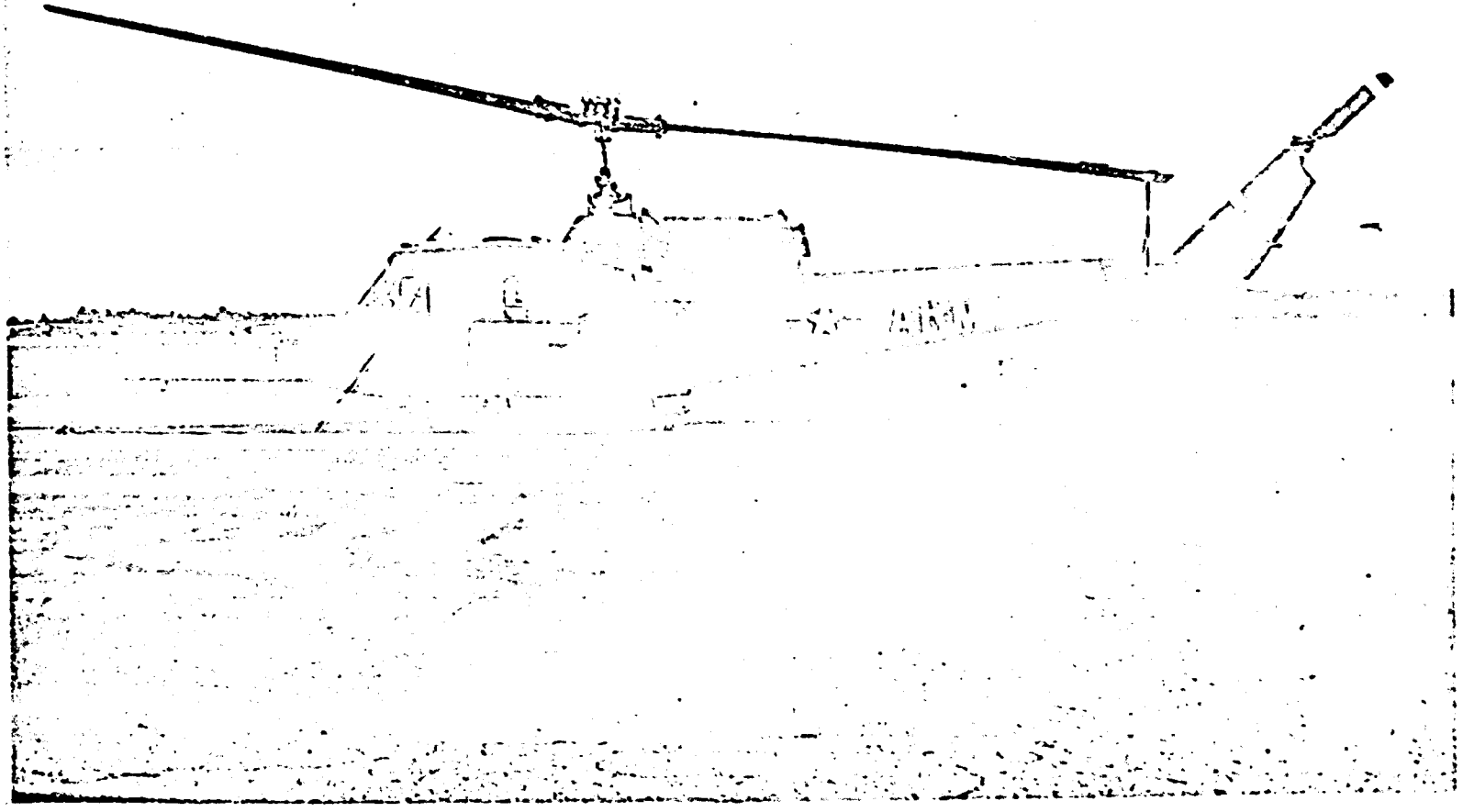

Figure 1. LEFT SIDE VIEW, HU-1B HELICOPTER WITH ARMAMENT SUBSYSTEM

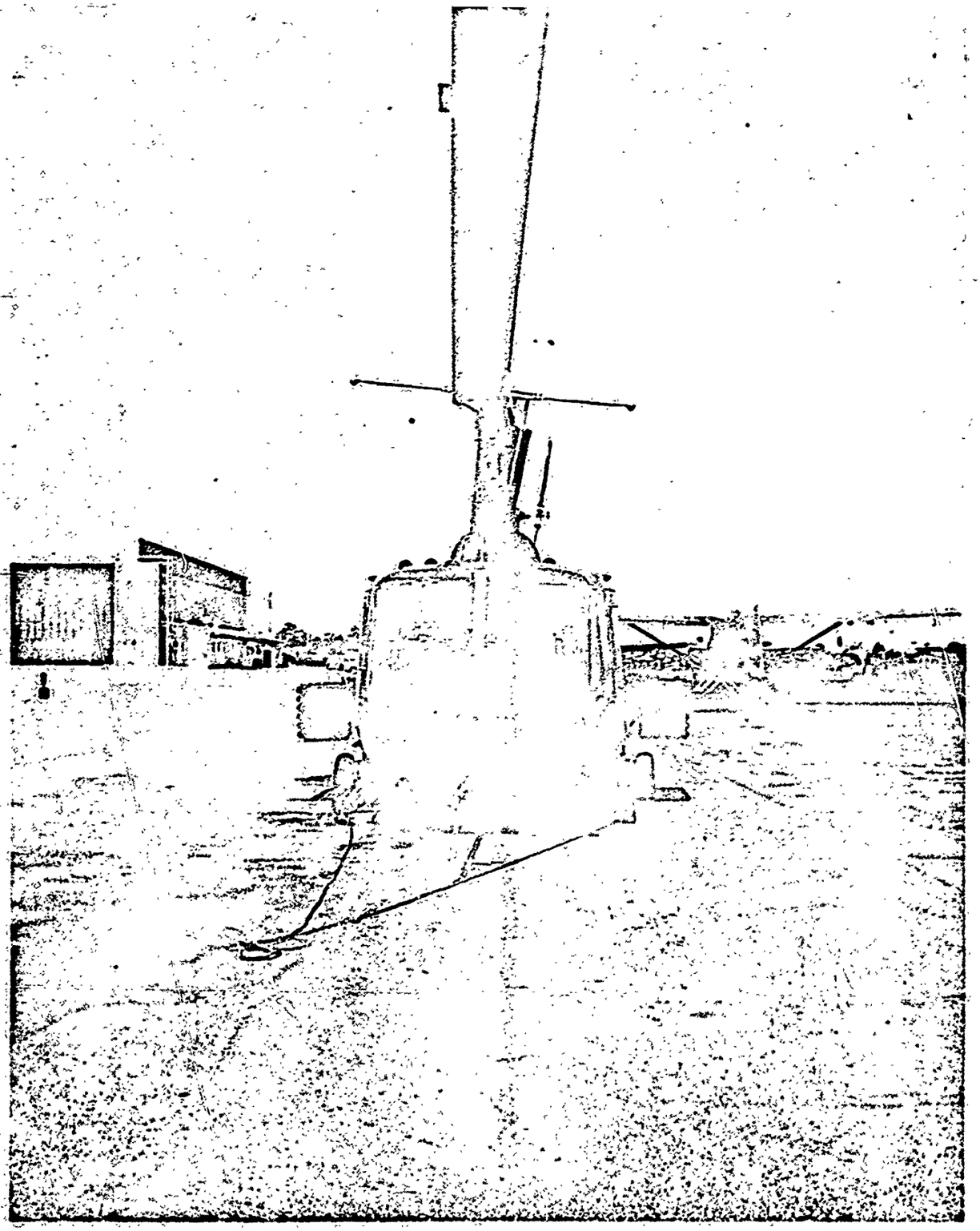

Figure 2. FRONT VIEW, HU-1B HELICOPTER WITH ARMAMENT SUBSYSTEM

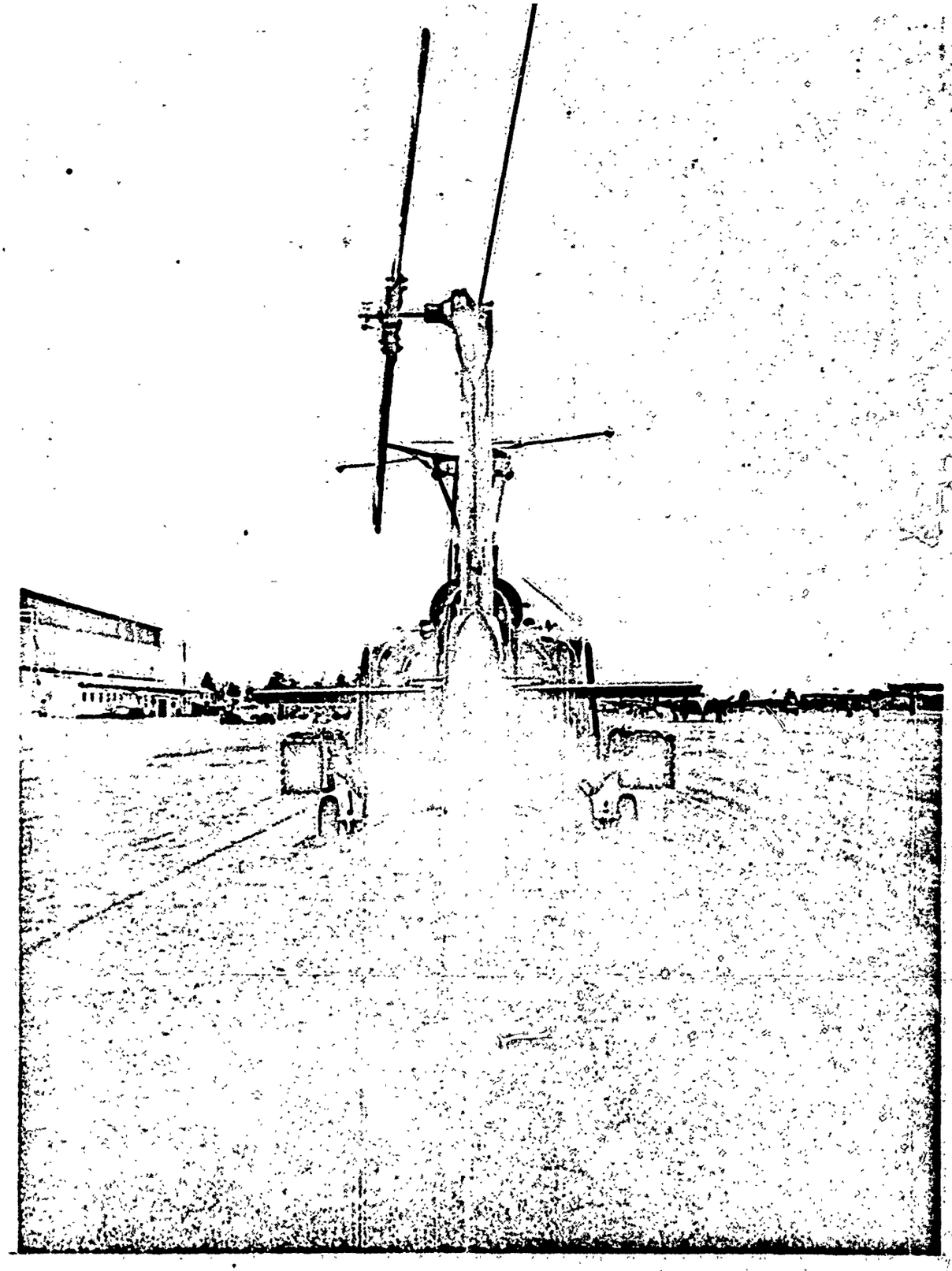

Figure 3. REAR VIEW, HU-1B HELICOPTER WITH ARMAMENT SUBSYSTEM

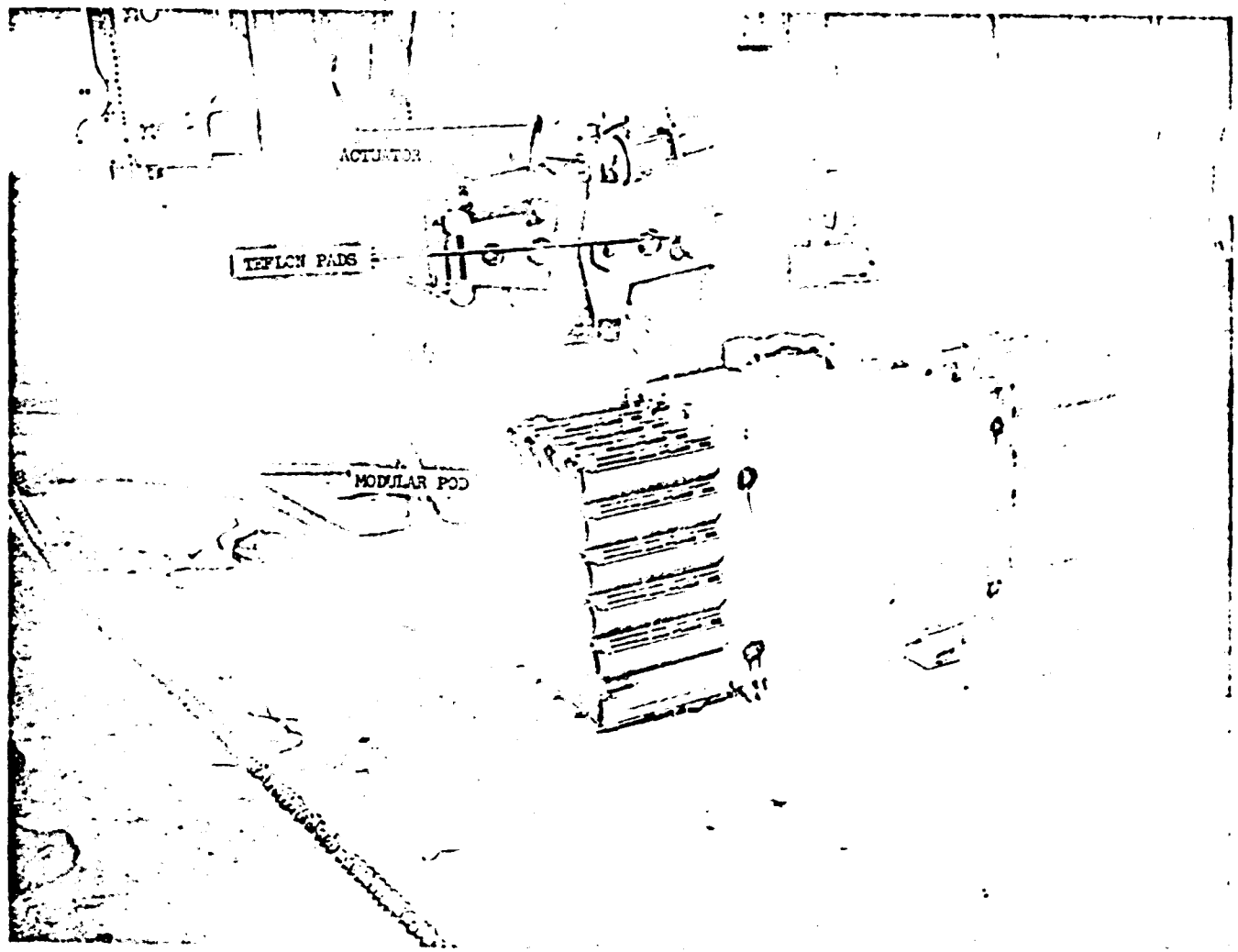

Figure 4. GENERAL VIEW, ARMAMENT PACKAGE

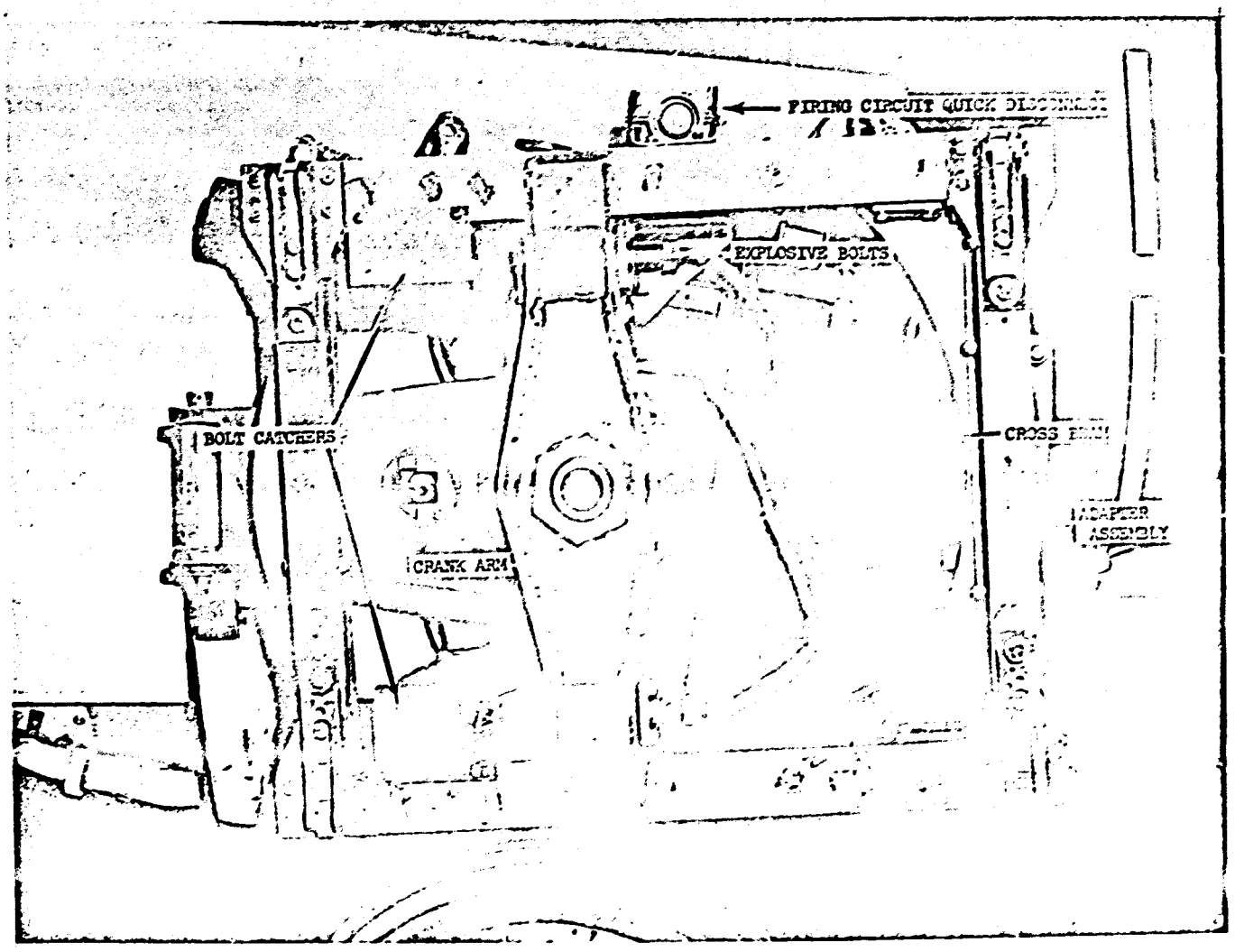

Figure 5. SIDE VIEW, ARMAMENT PACKAGE LESS MODULAR POD

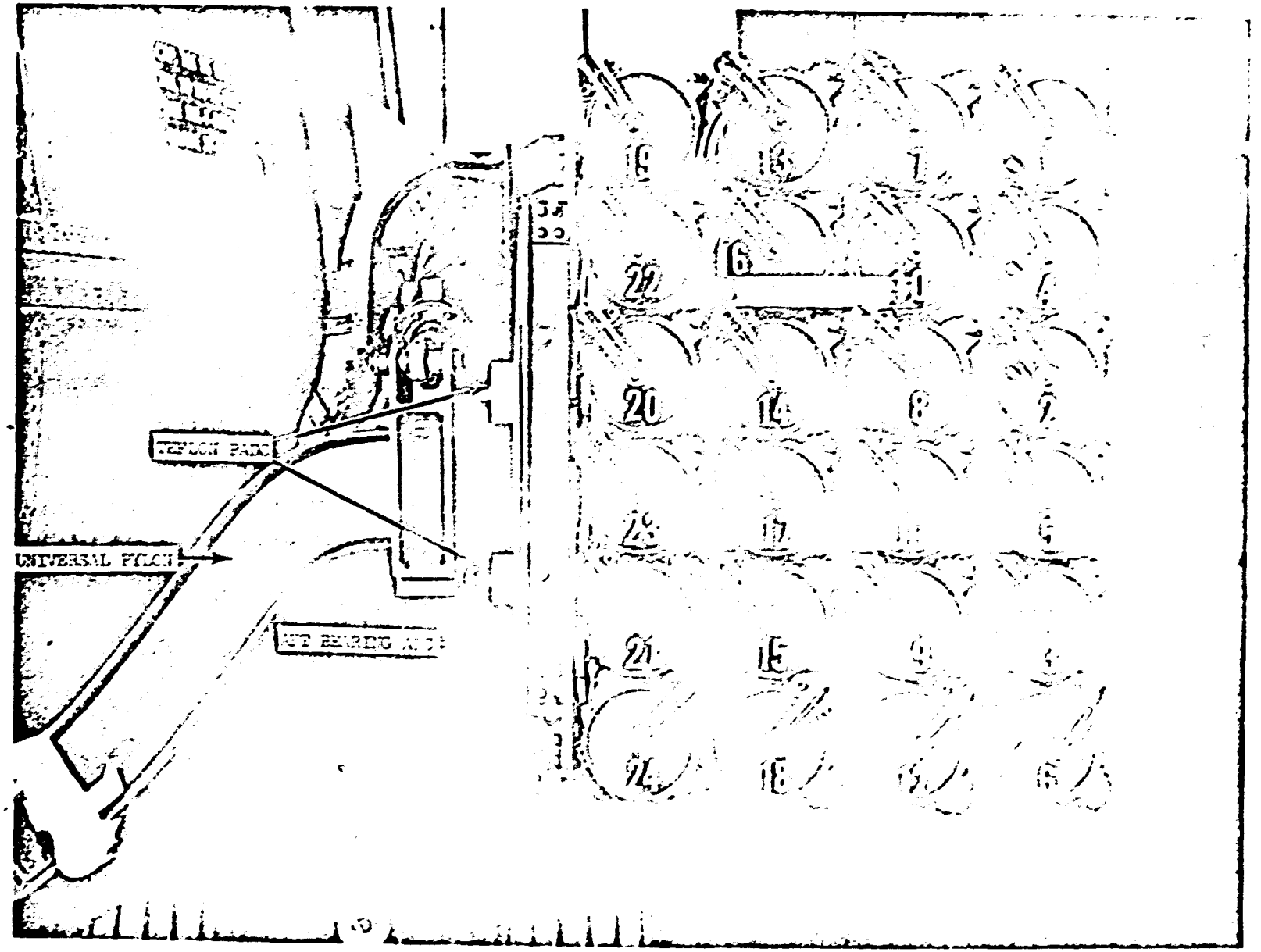

Figure 6. REAR VIEW, RIGHT ARMAMENT PACKAGE SHOWING ORDER OF FIRING BY TUBES

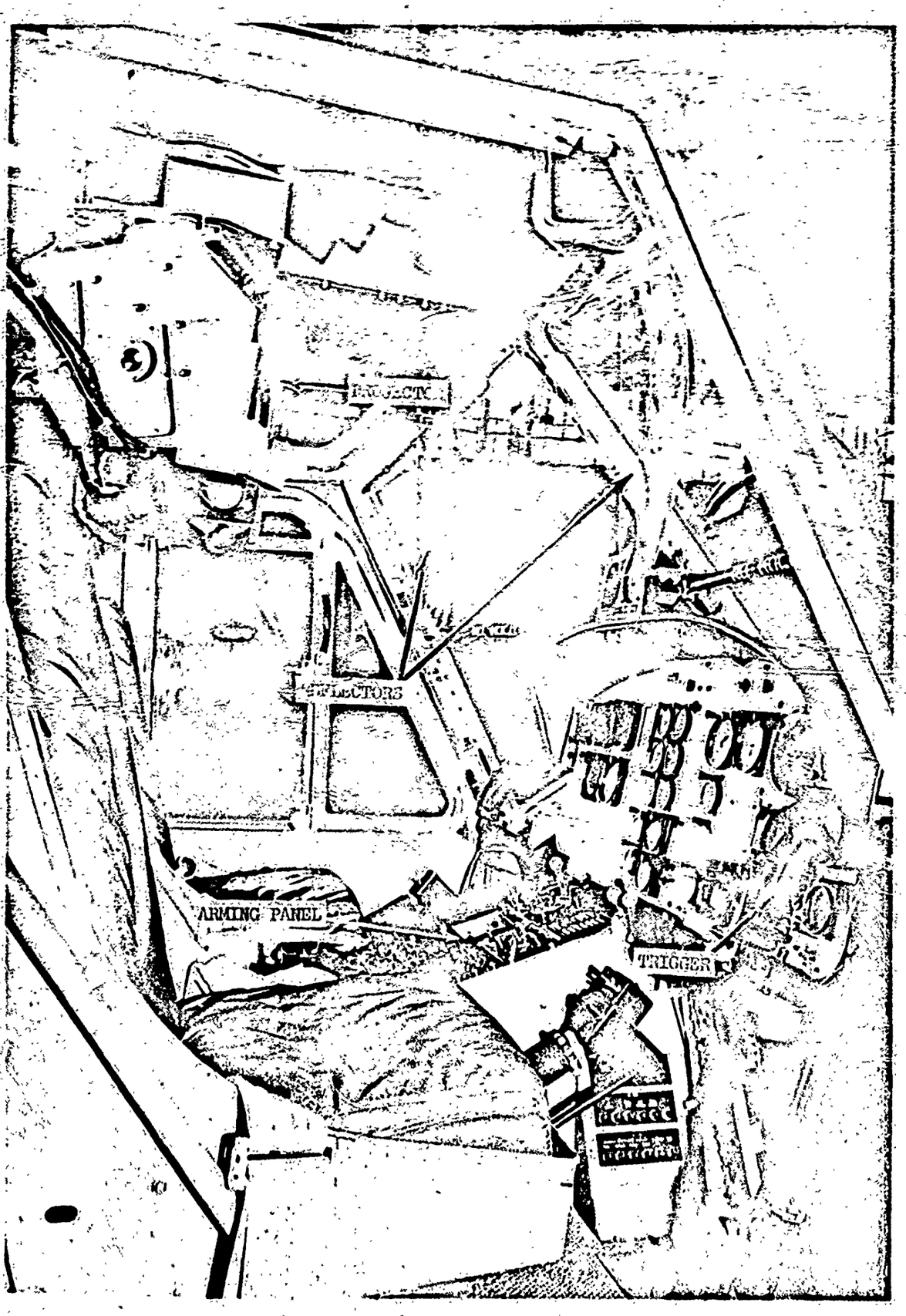

Figure 7. GENERAL VIEW, FIRE CONTROL SYSTEM

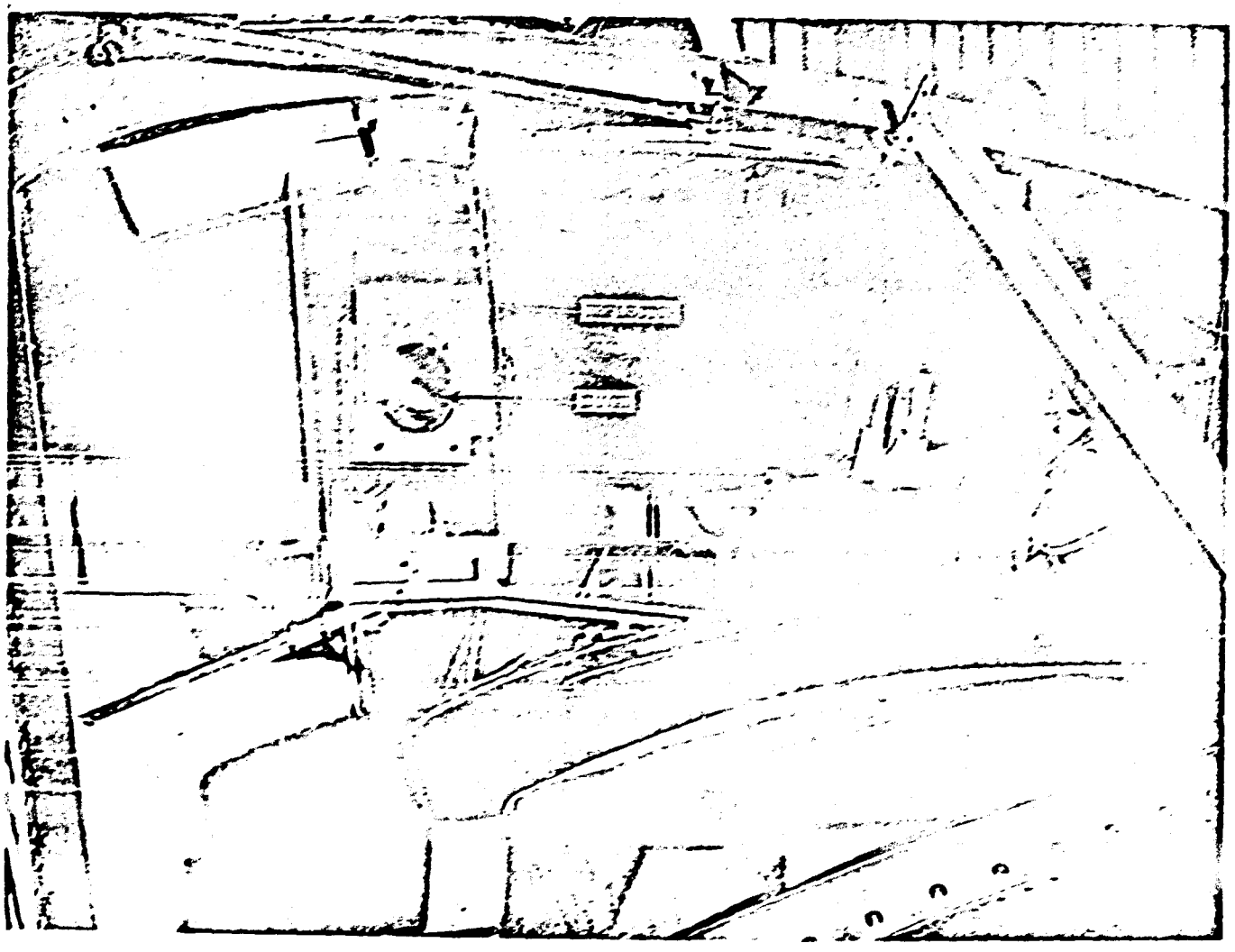

Figure 8. RETICLE IMAGE SHOWN ON REFLECTOR

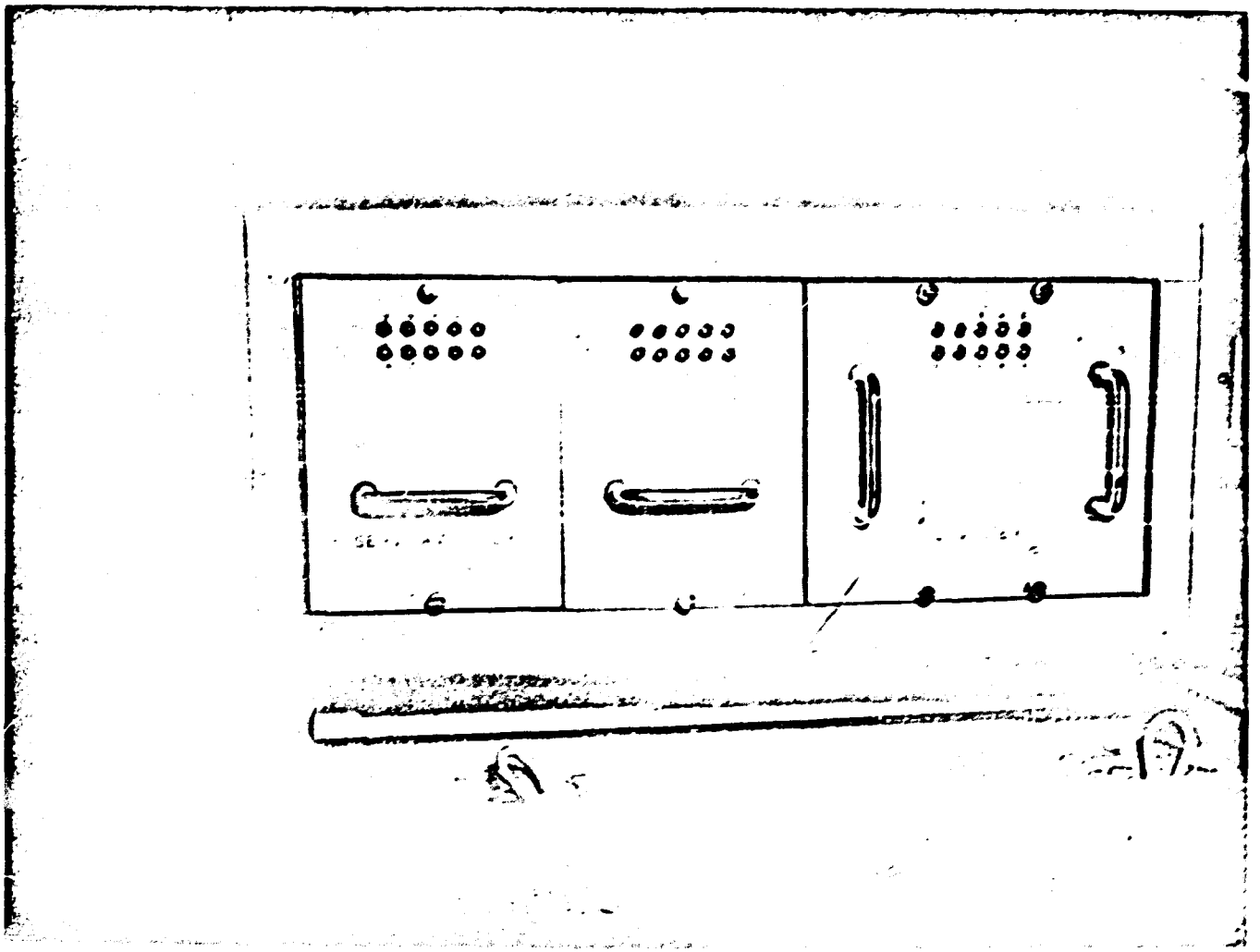

Figure 9. FIRE CONTROL COMPUTER AND SERVO AMPLIFIER

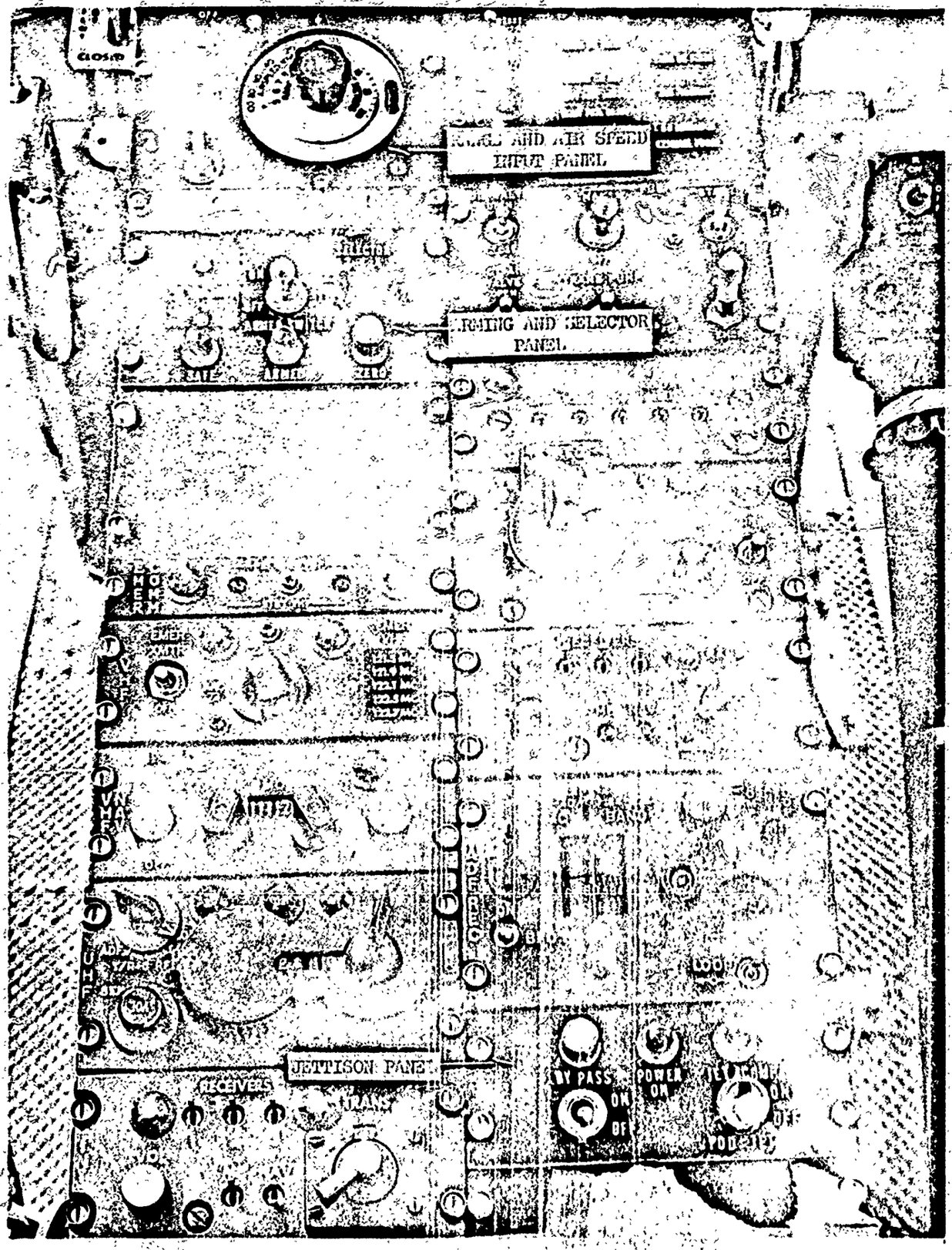

Figure 10. FIRE CONTROL PANEL ON HELICOPTER CENTER CONSOLE

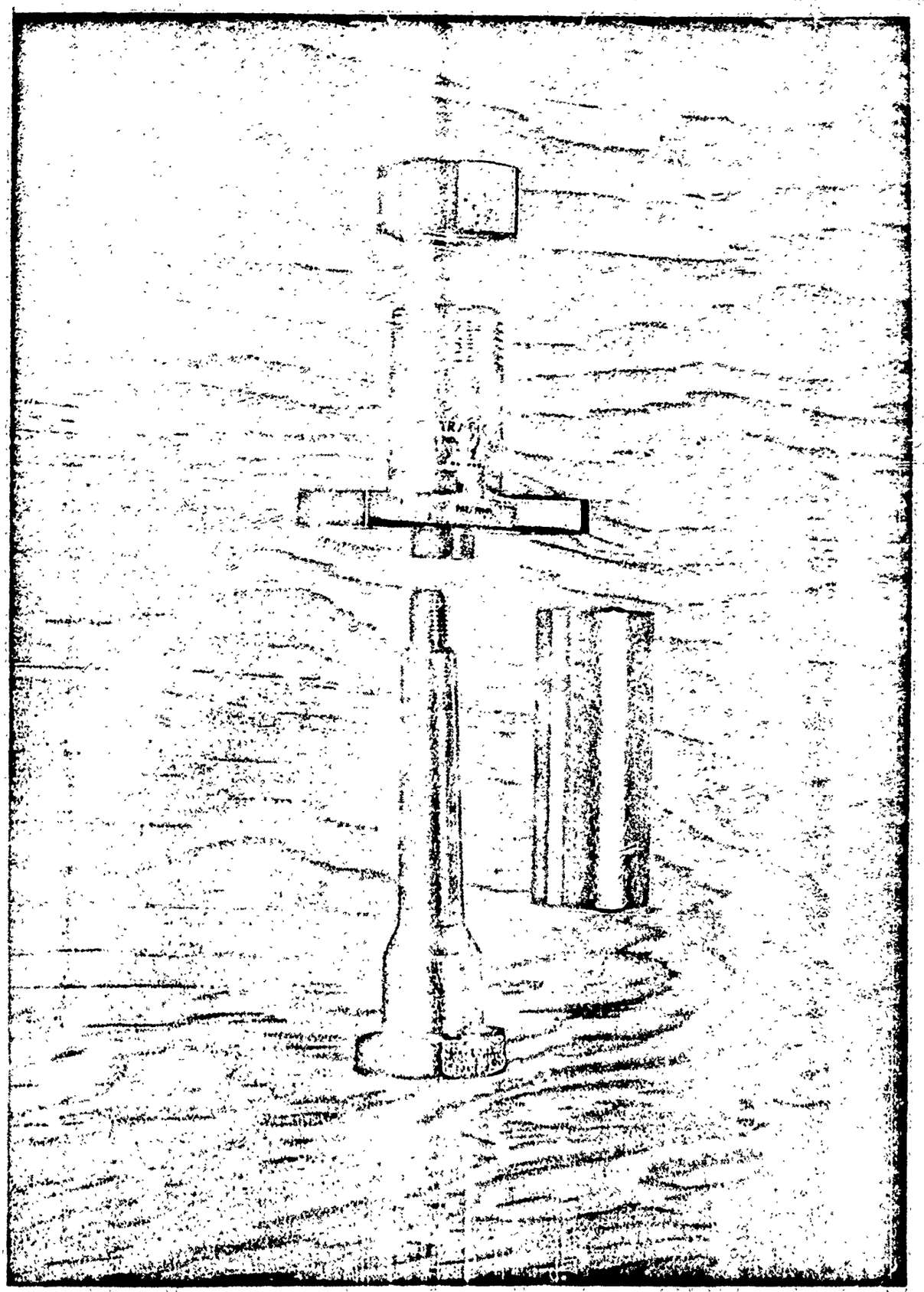

Figure 11. EXPLOSIVE BOLT SHOWING BOLT, COLLAR, SEPARATION NUT AND NUT CONTAINING THE SQUIB

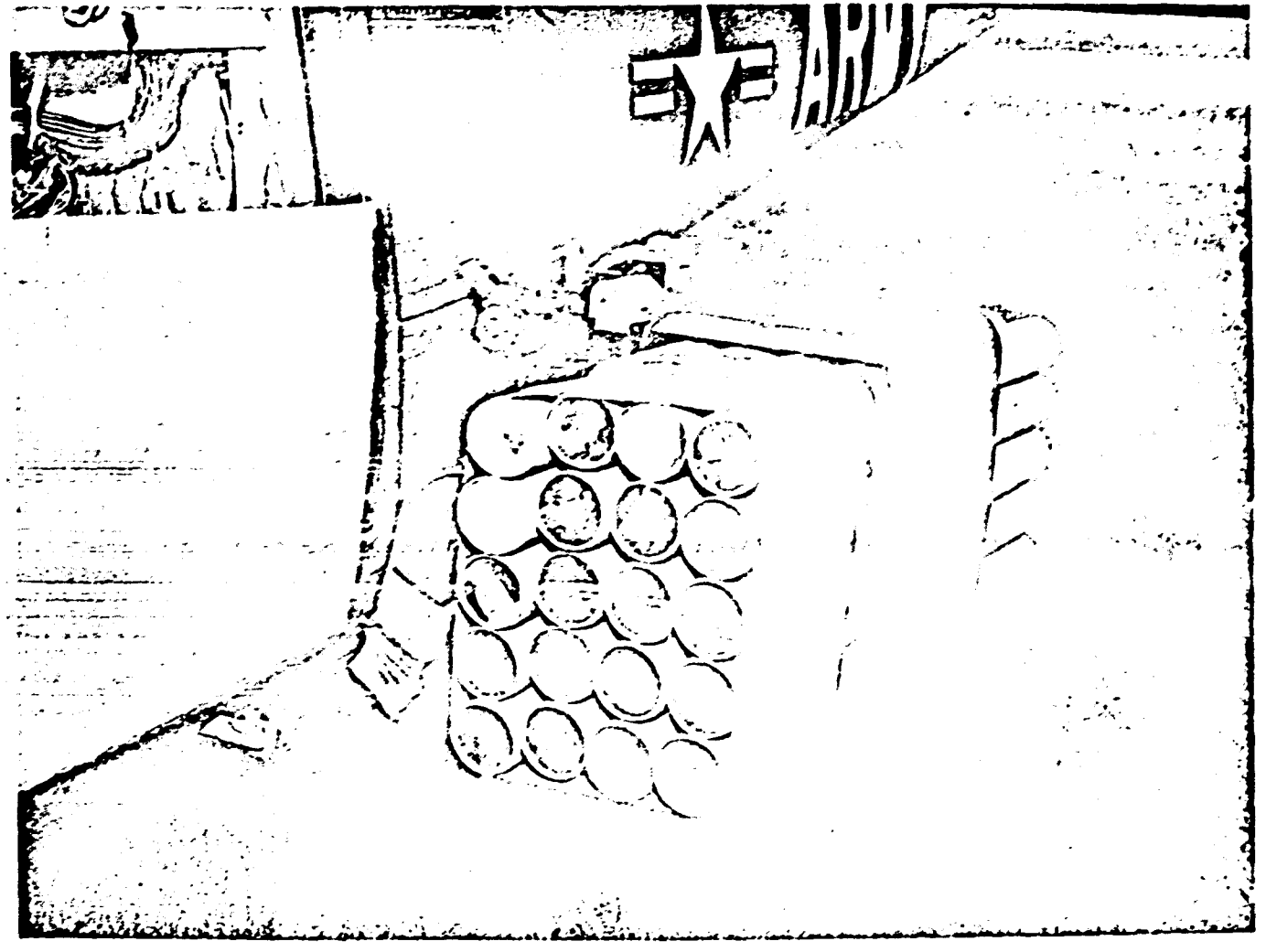

Figure 12. DUMMY LAUNCHER WITH SAND-FILLED CARDBOARD TUBES

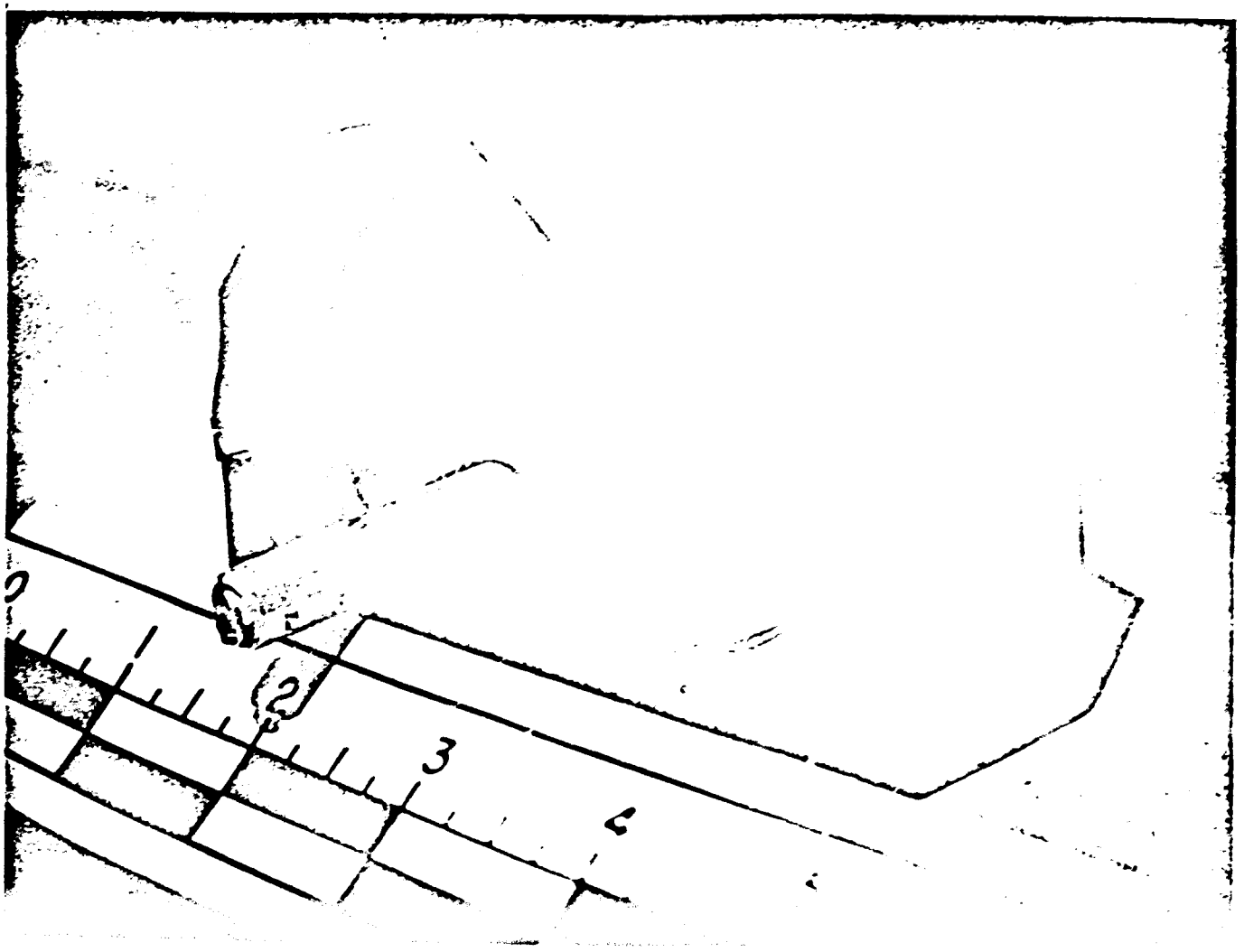

Figure 13. EXPLOSIVE BOLT (AND CATCHER) USED IN FLIGHT JETTISON TEST

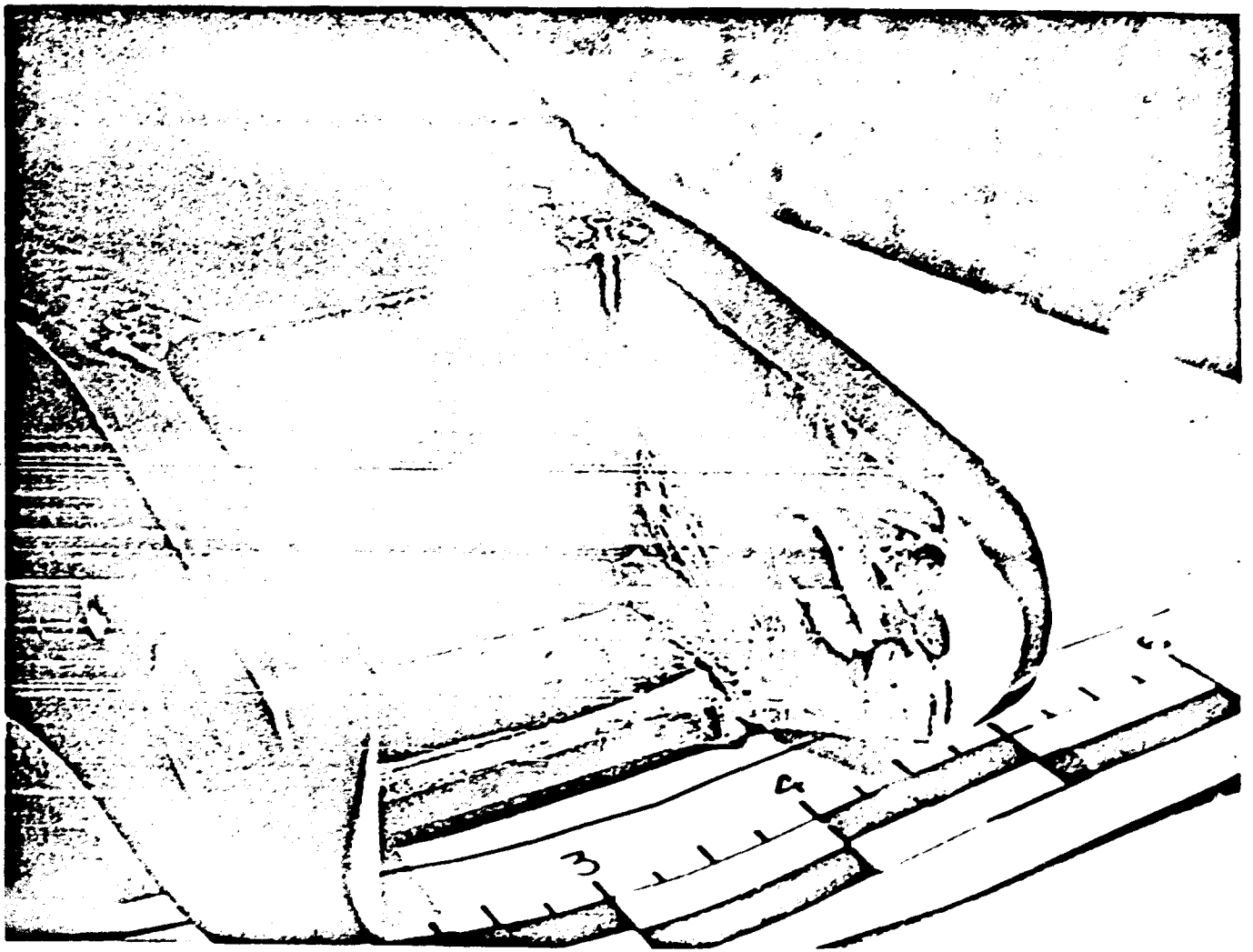

Figure 14. DAMAGED CRANK ARM RESULTING FROM FIRST IN-FLIGHT JETTISON TEST

REFERENCES

1. Revised Development Test Plan for Phase I Aircraft Interim Area Rocket Weapon System, 20 Nov 1961, with amendments, Army Ballistic Missile Agency, System Design and Development Laboratory, Redstone Arsenal, Alabama, ABMA Report No. RS-TM-61-4, (FOUO report).

2. Stone, Richard N. Jr., Results of 93 Aircraft Interim Area Rocket Weapon System Captive Tests, 15 Nov 1961, Army Ballistic Missile Agency, Test, Evaluation and Firing Laboratory, Redstone Arsenal, Alabama, ABMA Report No. RT-TN-61-6, (Confidential report).

3. Stark, Russell H., Projec. AAW, Monthly Data Report for September 1961, 26 Oct 1961, Army Rocket and Guided Missile Agency, Test and Evaluation Laboratory, Redstone Arsenal, Alabama, ARGMA Report TN2J188-2, (Unclassified report).

4. Stark, Russell H., Monthly Data Report for October and November 1961 for Phase I of the Interim Area Aircraft Armament Rocket System, 18 Jan 1962, Army Rocket and Guided Missile Agency, Test and Evaluation Laboratory, Redstone Arsenal, Alabama, ARGMA Report TN2J188-3, (Unclassified report).

5. Proposed Flight Test Program for an HU-1B Helicopter Equipped with 2.75-Inch Rocket Pods, Jan 1962, Air Force Flight Test Center, Flight Test Engineering Division, Edwards Air Force Base, California, AFFTC Report, (Unclassified report).

6. Development Operations Plan for Aircraft Interim Area Rocket Weapon System Program, Phases I and II, 25 July 1961 with 1st Revision dated 1 Nov 1961, Army Ordnance Missile Command, Control Office, Redstone Arsenal, Alabama, AOMC Report, (Confidential report).

7. System Design Requirements for Phase I Aircraft Area Rocket Weapon System, 13 Mar 1961, Army Ballistic Missile Agency, Systems Design and Development Laboratory, Redstone Arsenal, Alabama, ABMA Report No. RS-TM-2-61, (Confidential report).

8. Rutledge, William S. and Sanders, Myre E., Development Testing of the Phase I, Armament Subsystem, Helicopter, 2.75-Inch Rocket Launcher, XM3, 18 July 1962, U. S. Army Missile Command, Test and Evaluation Laboratory, Report No. RT-TM-62-15.

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